# LIMITED SCOPE CONCEPTUAL DEVELOPMENT SCHEME

FOR THE CREATION OF AN INTEGRATED, LOW IMPACT ENVIRONMENTALLY SUSTAINABLE LOT & TRANSPORTATION NETWORK

## Prepared for:

## **Rocky View County**

24141 Meadow Drive Rocky View County, Alberta, T3R 1A7 **https://www.county.com/articles/arti** 

## Prepared by:

## Western Water Resources (WWR) Inc.

◊ Office:(403) 217-2946 ◊ Cell:(403) 614-7372 ◊ Email: info@wwrinc.ca

## Planning Protocol

◊ Cell:(403) 703-1726 ◊ Email: rod@planningprotocol2.com

#### 200 – 1201 5 St., SW, Calgary, Alberta, T2R 0Y6

Globally Green Corporations - Planning and Engineering Holistically Sustainable Communities!

April 16, 2024

The proposed Limited Scope Conceptual Development Scheme for the creation of an Integrated, Low Impact, Environmentally Sustainable Lot and Transportation Network within the subject quarter section, was conceptualized by Western Water Resources and Planning Protocol, based on timeless and immutable principles for developing within environmentally sensitive landscapes. This and other such areas within Bearspaw, are characterized by unique glaciofluvial knob and kettle landscape features comprised of beautiful rolling hills and small lakes that infuse and capture the rural essence that draws people to live in this area of the County – one of the primary goals of the County's amended County Plan. The Conceptual Scheme builds upon the County's Environmental Stewardship goals and associated action plan, articulated within the County's Amended Plan, by providing tangible, practical quarter-sectionspecific action steps that will help to ensure that all future country residential development within the subject quarter, is measurably implemented in harmony with those goals.



Western Water Resources (WWR) Inc. is a professionally registered environmental and water resources engineering company with the Association of Professional Engineers and Geoscientists Alberta (APEGA) and is therefore licensed to engage in the practice of professional engineering within the Province of Alberta. Western Water Resources has over 22 years of experience in the practice of environmental and water resources engineering in the land development industry in Alberta and has primarily focused on helping landowners and/or developers on all environmental and water resources-related issues, which has included expert witness and conflict resolution services, within the land development industry in Rocky View County, and surrounding counties and



municipalities.

Planning Protocol has over 25 years of experience in rural and urban planning as a private, professional planning consultant in the land development industry in both eastern and western Canada and has successfully helped numerous landowners and/or developers over that period to navigate the myriad of

challenges associated with all aspects of the planning associated with land development.

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### SUBJECT

PROJECT TYPE:	LIMITED SCOPE CONCEPTUAL DEVELOPMENT SCHEME
ON BEHALF OF:	SAM AMINI AND MANSOUREH RASHIDI FAMILY
PROPOSED DEVLOPMENT:	MULTI-LOT COUNTRY RESIDENTIAL DEVELOPMENT
LEGAL ADDRESS:	PLAN 8911077; BLOCK 15; SW¼ 32-25-02-W5M
CIVIC ADDRESS:	24141 MEADOW DRIVE, CALGARY, ALBERTA, T3R 1A7
COUNTY/PROVINCE:	ROCKY VIEW COUNTY, ALBERTA

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## 1 EXECUTIVE SUMMARY

In response to an application prepared by the Applicant, Western Water Resources (WWR) Inc., for and on behalf of the Amini and Rashidi Family, to redesignate a 7.19-ac (2.19-ha) parcel of land from Residential, Rural District (R-RUR) to Residential, Country Residential District (R-CRD), into three (3) lots, comprised of an existing lot with a house on the south side and two (2) new lots on the north side, immediately south of and adjacent to Meadow Drive, a Limited Scope Conceptual Development Scheme was requested by Rocky View County Planning Services, including a future shadow plan conceptualizing the full buildout of SW<sup>1</sup>/4 32-25-02-W5M. the subject quarter section. As such Western Water Resources (WWR) Inc. and Planning Protocol have prepared Limited Scope Conceptual Development Scheme for a Low Impact, Integrated, Environmentally Sustainable Lot and Transportation Network, with an emphasis on building upon the County's environmental stewardship goals and supporting actions towards the realization of those goals, and ultimately, the full expression of the County's vision, as articulated in the amended County Plan, stated thus:

"Rocky View is an inviting, thriving, and sustainable county that balances agriculture with diverse residential, recreational, and business opportunities."

The proposed Limited Scope Conceptual Development Scheme for the creation of an Integrated, Environmentally Sustainable Lot and Transportation Network within the subject quarter section, was conceptualized based upon a combination of the principles underpinning Low Impact Development (LID) and Integrated Water Resources Management, for developing within environmentally sensitive landscapes. This and other such areas within Bearspaw, are characterized by unique glaciofluvial knob and kettle landscape features comprised of beautiful rolling hills and small lakes that infuse and capture the rural essence that draws people to live in this area of the County – one of the primary goals of the County's amended County Plan.

The Limited Scope Conceptual Development Scheme builds upon the County's Environmental Stewardship goals and associated action plan, articulated within the County's Amended Plan, by providing tangible, practical, quarter-section-specific action steps that will help to ensure that all future country residential development within the subject quarter, is implemented in harmony with those goals.

The implementation of this holistically sustainable approach will require the integration and practical application of the operating principles underpinning: 1) Low Impact Development (LID) and 2) Integrated Water Resources Management (IWRM) strategies. The operating principles, functioning synergistically, represent a powerfully comprehensive framework for managing water, land, and biotic (or living) renewable natural resources, while balancing the social and economic needs and protecting the sensitive ecosystems as the subject quarter continues to grow at a moderate rate towards the full buildout of the subject quarter, this in alignment with the County's growth management strategy. The community will continue to sensitively integrate the natural resources that abound within the subject quarter, through the practical application of these holistically sustainable principles, to ensure that this environmentally sensitive area of Bearspaw be, in perpetuity, protected through and beyond its future buildout capacity.



## 2 INTRODUCTION

#### 2.1 Limited Scope Conceptual Development Scheme Purpose

A Limited Scope Conceptual Development Scheme has been prepared to provide a comprehensive framework for land use planning, to guide landowners and/or developers within this environmentally sensitive landscape, to develop in a manner that supports, builds upon, and harmonizes with the County's environmental stewardship goals...by providing tangible, practical, action steps to help ensure the protection of the subject quarter's natural resources in the wake of future development.

It is respectfully proposed that the implementation of this holistically sustainable approach embrace the operating principles underpinning the following resource management strategies:



The operating principles, functioning synergistically, represent a powerfully comprehensive framework for managing water, land, and biotic (or living) renewable natural resources, while balancing the social and economic needs and protecting the sensitive ecosystems as the subject quarter continues to grow at a moderate rate towards the full buildout of the subject quarter, this in alignment with the County's growth management strategy to direct the majority of residential growth to those areas conceptually illustrated on **Map 1** within the County Plan amended November 6, 2023 (Bylaw C-7280-2013), given as **Figure 1** below, identifying existing country residential community growth areas and future urban growth areas within the County.

#### 2.2 Limited Scope Conceptual Development Scheme Objectives

The provisions of this Limited Scope Conceptual Development Scheme will apply to the following subject lands and subject quarter in which the subject lands fall:

#### PLAN 8911077; BLOCK 15; SW¼ 32-25-02-W5M

To provide development guidance to support continued development within these areas of growth, the Bearspaw Area Structure Plan (BPASP) was adopted in 1994. Since its adoption, several CSs for larger multi-lot Country Residential Developments were prepared and adopted by RVC Council. Additionally, the recently amended County Plan was prepared and adopted. This plan places a strong focus on





environmental stewardship and sustainability. It clearly recognizes just how critical the protection of the natural resources is in the wake of developing those areas within the County that they have targeted for future growth, conceptually illustrated in **Figure 1** below.

As such, the community will continue to sensitively integrate the natural resources that abound within the subject quarter, through the practical application of the principles underpinning said resource management strategies.



Figure 1: Managing Growth (Modified from Map 1 – Managing Growth, Amended County Plan, November 6, 2023)



## 3 RVC COUNTY PLAN

The County's Plan, amended November 6, 2023 (Bylaw C-7280-2013), is the County's principal statutory plan. It is the County's Municipal Development Plan (MDP) prepared in accordance with the Municipal Government Act (MGA). The County Plan was adopted by bylaw and provides strategic growth direction, overall guidance for land use planning, and service delivery policy.

The County Plan also provides specific policy guidance for areas that do not fall within the boundaries of an area structure plan or other subordinate plan. In this case, the proposed 3-Lot country residential subdivision development within Subject Lands will primarily be dictated or guided by the Bearspaw Area Structure Plan (BPASP), except for several key elements within this plan that have been improved or expanded upon through the amended County Plan.

The County Plan is a top-level planning document in which all other planning must align. The Plan is the first line of policy considered by County planning staff when evaluating any redesignation or subdivision application. While the Development Plan addresses a range of issues relating to land development, the residential development policy is particularly relevant.

Rocky View County (RVC) is unique as a rural municipality, but it struggles with a challenge common to all rural municipalities located on the fringe of large urban centres - growth pressure. Over a 20-year period (1991 to 2011), RVC's population grew by 93% as people migrated into the Calgary region. Rocky View residents understand the reality of regional growth and are willing to accept a "moderate level of growth if natural landscapes, rural character, agriculture and finances can be sustained" – collectively, a holistically sustainable approach to development. The County Plan lays out a framework for balancing these various and sometimes competing challenges.

#### 3.1 Environmental Stewardship

County residents have a strong connection to the natural environment; valuing water, watersheds, working agricultural land, and wildlife. However, by the very nature of building communities, developing business parks, and farming and ranching, the environment <u>will</u> undoubtedly be affected.

The County approves where development is located, how it is built, and how it operates. The County Plan supports decisions that <u>minimize</u> the adverse impacts of development on the environment - the primary or overarching objective of this Limited Scope Conceptual Development Scheme for the subject quarter. The Plan's policies in this section are supported and guided by the following provincial direction:

The MGA that provides the legislative framework for statutory plans that "...<u>maintain</u> and <u>improve</u> the quality of the physical environment."





- Land Use Framework Strategy, which encourages conservation, land stewardship, healthy ecosystems, and the efficient use of land.
- - A safe, secure drinking water supply
  - Healthy aquatic ecosystems; and
  - Reliable, quality water supplies for a sustainable economy.

Achieving a sustainable environment requires integration across the Plan. In addition to the policies and actions listed below, other policies addressing land stewardship, water, wastewater, stormwater, and the efficient use of land, are captured in the agriculture, managing growth, building communities, utility, and solid waste sections.

#### 3.1.1 Goals

- Manage private development and County operations in a way that <u>maintains</u> and <u>improves</u> the quality of the natural environment.
- Encourage partnerships and public education initiatives that contribute to environmental awareness and management.
- **4** Provide a safe, secure, and reliable drinking water supply.
- **4** Treat and manage stormwater and wastewater to protect surface water, riparian areas, and wetlands.
- Practice sound land use planning to protect agricultural operations, native habitat, environmentally sensitive areas, of which the subject quarter constitutes, and wildlife corridors.
- **4** Retain rural landscapes, dark skies, open vistas, and agriculture lands.
- Promote and implement conservation measures to reduce waste, improve water use, reduce land consumption, and increase building energy efficiency.

#### **3.1.2** Groundwater Resources

Protect groundwater resources and ensure use does not exceed carrying capacity by:

- **4** Supporting long term groundwater research and monitoring programs.
- **Witigating the potential adverse impacts of development on groundwater recharge areas.**
- Adhering to provincial groundwater testing requirements, as part of the development approval process; and
- Encouraging and facilitating the capping of abandoned water wells to protect against groundwater leakage and cross contamination.





Use relevant watershed management plans as guiding documents and planning tools. In Bearspaw, the Bearspaw Master Drainage Plan (BPMDP) would govern.

#### 3.1.3 Stormwater and Wastewater Resources

The following points related to stormwater and wastewater will apply to all proposed country residential developments within the County, and will supersede any area structure plans that are older and may be silent, outdated, and therefore irrelevant to these points:

- Require environmentally sustainable wastewater disposal practices, which could conceivably include the treatment and recycling of wastewater to potable or drinkable water standards, to protect watersheds and surface/ground water quality.
- Wastewater treatment systems should not exceed the land's carrying capacity, which is determined through a Model Process Assessment, the level of which is determined by Engineering Services at the County.
- **4** Effectively treat stormwater to protect surface water, riparian areas, and wetlands.
- Encourage and support Low Impact Development (LID) as an approach to treat and manage stormwater.
  Please Note: LID designs shall be "Chinook-friendly"; that is, they should be designed to function or operate within this prairie-steppe type climate.
- Stormwater treatment should avoid the use of natural wetlands, unless it can be demonstrated through the provincial environmental governing agency that there will be no adverse impacts to this resource.
- Support the use of constructed stormwater wetlands for treatment and storage of surface runoff, which would include incentivizing landowners to identify areas within their lands, where existing wetlands and/or natural depressions could be expanded to create additional wetland areas to help offset the historical loss of wetlands within the province. Please Note: Ducks Unlimited (DU) can facilitate, at no cost to landowners, the design and construction of wetlands, which would include the expansion of existing wetlands.
- Stormwater treatment and storage facilities shall not be located in floodways or riparian areas located along waterways.

#### 3.1.4 Land and Environmental Stewardship

The following points related to land and environmental stewardship will apply to all proposed country residential developments within the County, and will <u>supersede</u> any area structure plans that are older and may be silent to these points:

- Encourage the efficient use of rural land and infrastructure by directing residential, commercial, and industrial development to the defined growth areas and by encouraging infill development within those areas.
- Support the conservation and effective management of riparian areas and wetlands in accordance with County Policy.





- Encourage sustainable agricultural operations through sound land stewardship.
- Lincourage development to retain and reintroduce natural habitat and native grasslands.
- Levelopment shall be planned, designed, and constructed to protect alluvial aquifers.
- Development applications <u>may</u> require the preparation and implementation of a Biophysical Impact Assessment (BIA) to protect environmentally sensitive areas, such as sensitive wetlands, if a proposed development is situated adjacent to or upstream from said resources and could potentially impact the resource(s).
- Environmental site assessments shall be required when a previous use may have or is suspected to have contaminated a proposed development area.
- Utility systems shall be designed and constructed to minimize adverse impacts to environmentally sensitive areas, as identified by a Biophysical Impact Assessment (BIA).
- Require the control and eradication of regulated weeds on private and public land in accordance with the provincial regulations and County Policy.

#### 3.1.5 Development in Hazard Areas

The following points related to the development of lands within hazardous areas, which includes all proposed country residential developments within the County where potential hazards are identified during the land development process, and will, as applicable, supersede any area structure plans that are older and may be silent relevant to these points:

- Development in hazard areas, such as flood fringes and escarpments, shall be allowed only if an appropriate technical evaluation demonstrates suitability, to the satisfaction of the County and in accordance with the Land Use Bylaw.
- Development within the flood fringe is discouraged and, where allowed, shall comply with the Land Use Bylaw.

#### 3.1.6 Environmentally Sustainable Construction Practices

The following points related to environmentally sustainable construction practices will apply to all proposed country residential developments within the County, and will supersede any area structure plans that are older and may be silent relevant to these points:

- Country residential development should be built with the contours of the land and avoid stripping and grading.
- Require best management construction practices to reduce wind and water erosion of soils and to suppress dust dispersion.

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**4** Encourage and support proper disposal and recycling of solid waste from construction.



#### 3.1.7 Conservation Practices

The following points related to conservation practices will apply to all proposed country residential developments within the County, and will supersede any area structure plans that are older and may be silent relevant to these points:

- Encourage and support conservation design as a form of compact residential development in new or amended area structure plans.
- 4 Encourage potable water conservation measures for all users of public and private water systems.
- **4** Encourage green building techniques and energy efficiency in subdivision and building design.
- Maintain dark skies by:
  - Ensuring dark sky principles are incorporated when developing or amending area structure plans.
  - Requiring public and business lighting in outdoor areas to be downward directed and conform to the Land Use Bylaw.
  - Encouraging residents to use downward directed lighting.
- Support and encourage the use of agricultural land for small scale production of renewable sources of energy.
- Provide convenient, cost effective, and environmentally responsible ways to reduce, reuse, and recycle household waste.

#### 3.1.8 Supporting Actions

The following actions are proposed by the County in support of the County's most current Environmental Stewardship initiatives to ensure that development within the County is carried out using a holistically sustainable approach:

- Develop an environmental review checklist to provide for consistent review of development applications (goal 1).
- Undertake an inventory of regionally important environmental areas and develop policies and procedures to address these areas (goal 4).
- Review the Land Use Bylaw to establish criteria with respect to building setbacks from escarpments to preserve viewscapes and ensure safety (goal 5, policy 7.21).
- Assess the use of Transfer Development Credits, in accordance with the Alberta Land Stewardship Act, as a way to direct development to preferred growth areas in order to sustain agriculture, benefit agriculture landowners, and achieve compact development (policy 7.26).
- Develop a water conservation policy for public utility systems and adopt water conservation policies in new or amended area structure plans (policy 7.27).
- **4** Review the dark sky lighting requirements of the Land Use Bylaw (policy 7.29).





The challenge to county residents, landowners, and developers is to build communities that retain a rural sense and feel. The following list was created as part of the County's Plan to help planners, designers, engineers, and developers to develop in a manner that supports what the County deems will help capture the characteristics that will help retain said rural sense and feel that was identified as being valuable to the residents within the County.

#### 3.2.1 Sense of Country Living

- Self-reliant and independent
- Community
- 🖊 Privacy
- \rm 4 Quiet
- Space and distance
- Nature and wildlife
- ♣ Part of a distinct community

#### 3.2.2 Physical Characteristics

- Dark skies
- Paved roads connecting dispersed acreage communities
- ✤ Primarily residential development, variety of lot sizes, unique houses, and landscaping
- Limited commercial services and amenities, a community centre, and sports fields in the general area
- ✤ Piped water and wastewater, wells, and septic systems
- 4 May be schools in the general area
- Recreational trails, opportunities for walking, riding, and cycling

#### 3.3 Country Residential Development

Country residential communities are deemed a form of rural living. They play a significant role in shaping the landscape and providing a sense of belonging to their residents. The county has a number of country residential communities, some formally defined by area structure plan policy, such as the Bearspaw Area Structure Plan (BPASP), while others have grown gradually over time. In the County Plan commitment to holistically sustainable country residential development or growth is a priority, and the following sections below articulate the goals and polices that have been identified and support this commitment.





The following County goals are designed to support the County's commitment to said holistically sustainable country residential development within the County:

- Manage the planning and development of country residential communities so that they provide residents with a safe, healthy, and attractive community.
- **4** Support country residential communities in maintaining a strong sense of community.
- Encourage alternative residential development forms that retain rural character and reduce the overall development footprint on the landscape.
- Provide an effective process to support the orderly, efficient, and cost-effective development of fragmented quarter sections in agricultural areas.

#### 3.3.2 Policies

#### **Country Residential Communities**

The following County policies were created to guide and support Country residential community growth and development within the County:

- Development within Greater Bragg Creek, Bearspaw, North and Central Springbank, Elbow Valley, Balzac East (Sharp Hills/Butte Hills), Cochrane North, and Glenbow Ranch shall conform to their relevant area structure plan; in this case, the Bearspaw Area Structure Plan (BPASP).
- Country residential development in the agriculture area shall be guided by the goals and policies of this Plan.
- Encourage and support country residential communities in providing a high-quality built environment while maintaining rural character.
- Country residential development shall address the development review criteria identified in section 29 of the County Plan.



## 4 BEARSPAW AREA STRUTURE PLAN (BPASP)

The Bearspaw Area Structure Plan (BPASP) is a statutory plan prepared in accordance with the MGA. The area structure plan is subordinate to the County Plan and provides a land use strategy for redesignating (rezoning) and developing a specific area of land in the County. It contains maps, goals, and policies, which set out general locations for major land uses (e.g. residential, commercial, institutional, schools, and parks), major roadways, utility servicing, and recreation.

ASPs guide development in country residential communities, hamlets, regional business centres, and highway business areas.

#### 4.1 Applicable BPASP Polices & Objectives

The Bearspaw Area Structure Plan establishes Council policies for the comprehensive growth management of the Plan Area in accordance with the objectives set out below, and are thus applicable to the proposed development of the Subject Lands:

- To establish a future land use scenario for the Plan Area that in concert with sound land use planning principles will provide a future reference for the achievement of an efficient development pattern while balancing and protecting the character of the Bearspaw community.
- To guide growth and change within the Plan Area through the implementation of sound land use planning policies.
- To facilitate the review and evaluation of the feasibility and appropriateness of any redesignation, subdivision and/or development proposal within the Plan Area in accordance with an established framework of policies.
- To achieve the goals and objectives of the General Municipal Plan through the implementation of sound land use planning policies.
- To protect, conserve and/or enhance the unique natural features of the Plan Area by requiring proposals for redesignation, subdivision and/or development to consider these features and implement measures that will avoid or mitigate any resulting potentially negative impacts.
- To facilitate the provision of essential community services in accordance with the needs of current and future development within the Plan Area.
- **4** To preserve the archaeological, historical and/or cultural heritage within the Plan Area.
- *Note:* The above objectives were extracted from the Bearspaw Area Structure Plan (BPASP). Bylaw C-4129-93, Adopted January 18. 1994, Municipal District of Rocky View No. 44.



#### 4.2 Regional Location of Subject Lands

The subject lands are bounded to the north by Meadows Drive and is located <sup>3</sup>/<sub>4</sub> of a mile west of Calgary city limits. **Figure 2** below illustrates the location of the Subject Lands relative to the Calgary city limits, or urban environment, to the east. The Subject Lands are surrounded by small, fragmented parcels of land to the north, south, east, and west. Meadows Drive is a county standard paved road with safe sight distances in both directions and as such is optimal for future fragmentation as there will not be any added cost or burden to County infrastructure to accommodate future development.

County policy documents (LUB, GMS, MDP) support the subdivision of already fragmented parcels in favor of preserving larger tracts of land for agricultural purposes.



Figure 2: Plan Area Location within Regional Map (Modified from Bearspaw ASP, Jan. 2024)

#### 4.3 Future Land Use

The future land use within the area surrounding the Subject Lands, as specified within the BASP, is slated for Country Residential as highlighted in yellow within **Figure 3** below.



Figure 3: Future Land Use (Modified from Figure 7 of the BPASP, Jan. 18, 2024)

#### 4.4 Development Phasing

To facilitate a logical, efficient, and planned development pattern within the Plan Area and to reflect public input, Phasing has been established and is illustrated in **Figure 5** below. Redesignation, subdivision and/or development of lands within the Plan Area should proceed in accordance with the priorities established in said figure. Notwithstanding the priorities established, development priorities for specific lands may be altered without amendment to this land at the discretion of the Municipality provided the consequences of development out of sequence are examined and the Municipality determines that any onsite planning issues

have been resolved pursuant to the provisions of this Plan. An examination of **Figure 5** below reveals that the Subject Lands are located within that area designated as having the highest development priority within Bearspaw - **Area 1**.



Figure 4: Future Land Use (Modified from Figure 8 of the BPASP, Jan. 18, 2024)

#### 4.5 Concept Exempt Areas in Bearspaw

Upon a close examination of **Figure 5** below, we respectfully observe that the Subject Lands are located within "Lands generally <u>not</u> requiring Conceptual Plans", and thus we see no compelling reason(s) justifying the preparation of a full Area Concept Plan or Scheme under Policy 8.1.21 of the BPASP, especially given the small number of lots proposed for this comparatively small country residential subdivision relative to the size of other subdivisions within Bearspaw that historically triggered the requirement to provide a full Area Conceptual Scheme.



Figure 5: Concept Plans (Modified from Figure 3 of the BPASP, Jan. 18, 2024)

## 5 KETTLEHOLE SPRINGS AT BEARSPAW

#### 5.1 Vision

Kettlehole Springs at Bearspaw (a proposed interim community name, the root of which name lies in the origins of the natural fluvioglacial landforms that characterize this area of Bearspaw) is an inviting, thriving community that balances its diverse residential, recreational, and business opportunities to meet its social and economic needs while powerfully embracing a comprehensive, holistically sustainable framework for managing its water, land, and biotic resources, to protect its sensitive pot and kettle ecosystems as it continues to grow and thrive as a community.

Kettlehole Springs at Bearspaw is a unique, high quality country residential community in Bearspaw. The community envisions a harmonious relationship between the built and natural environment that inspires a sense of continuity, rural character, and tranquility for its residents, in a rural country setting in proximity to a major urban centre - Calgary.

These owners of the proposed development are committed to preserving the natural environment within their lands, which includes the native terrain and poplar forests with their diverse understory vegetation and maintaining the ecological integrity of their lands. The land redesignation proposal recognizes the natural landscape and environment as a foundational asset of the proposed development, and therefore, it is their vision, together with this supportive community to minimize the development footprint of buildings and infrastructure, thus preserving the natural features within the proposed development that spawned embracing a low impact, integrated environmentally sustainable approach for the creation of this Limited Scope Conceptual Development Scheme, with the understanding that all the surrounding neighbors who we met with and sought support from (see Supporting Letters in **Appendix B**) for the redesignation application, were sensitive to the preservation or protection of the natural environment.

#### 5.2 Guiding Principles

The proposed Limited Scope Conceptual Development Scheme for the creation of an Integrated, Environmentally Sustainable Lot and Transportation Network within the subject quarter, harnesses a set of key operating or guiding principles formulated from two environmentally sustainable resource management strategies: 1) Low Impact Development (LID); and 2) Integrated Water Resources Management (IWRM). The principles from these strategies, combined together, create a powerfully comprehensive framework for the management of water, land, and biotic (or living) resources as an integrated system, while balancing the social and economic needs and protecting the sensitive pot and kettle ecosystems that characterize the subject quarter, meeting these needs as the subject quarter continues to grow at a moderate rate towards its full buildout, this in alignment with the County's growth management strategy.

#### 5.3 Stormwater Management Planning

Stormwater Management Planning in Rocky View County (RVC) for Country Residential Subdivision Developments, depending upon the proposed number of lots, the existing density of development surrounding the proposed development, the existence of a Master Drainage Plan for the area, the known or suspected impacts or negative consequences associated with the lack of historical stormwater management planning, such as flooding, will precipitate the requirement for either a Site-Specific Stormwater Implementation Plan (SSIP) or a Stormwater Management Plan (SWMP). If an SSIP, 100% of the difference between the pre-and-post-development stormwater runoff volume and runoff rates would be managed through the engineered design and construction of Low Impact Development (LID) designs that would serve to manage said differences while accentuating the aesthetic value, and potentially, the monetary value of the natural landscape. If a SWMP, then the runoff volumes and runoff rates would be largely governed by the Bearspaw Master Drainage Plan (BPMDP), which has established allowable annual runoff release volumes and a Unit Area Release Rate (UARR) in an attempt to offset the increase in natural background or baseline runoff volumes and peak runoff rates that occurred as a result of the lack of historical stormwater management planning within Bearspaw in the wake of development that occurred at a time when most developers and legislators where not aware of stormwater management planning and its importance, and/or the potential impacts, in the land development process. In the cases where the drainage within all or parts of a site is deemed to be internally drained; that is, where overland flows are contained and do not become part of the larger watershed area in which the BPMDP would govern, the Provincial "Net Zero" pre-to-post development runoff volumes and rates would apply.

Prior to illustrating the structure for the implementation for a site-specific LID drainage management prescriptive strategy, we would like to share the fundamental structure of the stormwater management planning process that we have routinely employed for years, which represents the precursor for the design and construction or implementation of an LID design, beginning with a general description of the two types of stormwater management planning levels that are commonly requested by engineering services in response to a proposed development, a condition that can either occur at the land redesignation stage; or following the approval of that, at subdivision.

#### 5.3.1 Stormwater Management Planning Process

The fundamental approach to stormwater management planning, particularly at the foundation of the process, applies to both a SSIP or SWMP. The following lays out the fundamental steps that we routinely employ to ensure that the product, either an SSIP or SWMP, accurately reflects the physical characteristics of the proposed catchment area(s) that make up and/or encompass a proposed development area, and that its eventual implementation will function in harmony with the area, mimicking as closely as possible, the pre-development hydrologic response of the catchment(s) area(s):

#### 1. Preliminary Historical Aerial Photographic Review

A preliminary historical aerial photograph review provides a quick overview of the proposed subject and surrounding lands prior to meeting with and walking subject lands with the landowner(s).

#### 2. Preliminary Site Reconnaissance Assessment

A preliminary site reconnaissance assessment is something that we routinely employ during the site-specific scoping of a land development project to allow us to interact and build a relationship with the landowner, who generally has a good understanding of their land, and frequently the surrounding neighbouring lands, around how their land and the adjacent lands have responded to large historical rainfall events, such as occurred in July 2013, and where stormwater tended to collect or pond during such events, where applicable. Such an approach allows us to form a visual picture of the physical characteristics of those catchment area(s) within and/or encompassing the proposed development area while capturing some preliminary photographs to reinforce and lock in a mental picture of what we observed, prior to proceeding with formalizing the process with the landowner. It also allows us to quickly assess the insitu and downstream magnitude of the risk of the proposed development on every reasonably conceivable resource value.

#### 3. Generation of Topographical Map

The creation of a digital LiDAR-generated topographical map is fundamental to stormwater management planning and all resource management planning, and represents the foundation or base layer upon which all other layers of information will be built during the field data acquisition process, or the building of the field hydrology model, the precursor for the building of a computer-based hydrological and hydraulics model that is routinely used in stormwater management planning as an predictive or forecasting analysis tool. The digital topographical map is used as the base-layer within the computer model and so it must accurately reflect the elevation characteristics within each subcatchment(s) area, upstream and downstream from the subject lands, if the subcatchment(s) either contribute overland flows to the subject lands or away from the subject lands onto adjacent or neighboring lands, or to downstream resources that could conceivably be impacted following development.

#### 4. Field Data Acquisition Model

The field data acquisition model or hydrology field model represents, as said, the precursor for the building of the computer-based hydrological and hydraulics model used in stormwater management planning as an analysis forecasting or predictive tool to evaluate the differences between pre- and post-development peak runoff volumes and peak rates. In our years of experience, we consider this to be the most critically important part of the stormwater management planning process, because the accuracy of that data, directly affects the downstream runoff volume and peak flow analysis results and any final stormwater management LID hydraulics design that may be implemented within any lands proposed for subdivision development. The following subcatchment data or information is routinely collected and GPS-photographed, where relevant:

- a) Subcatchment Designation Each subcatchment area is assigned a descriptor or Subcatchment Identifier Code (SC-1....SC-n).
- **b)** Subcatchment Delineation The topographic boundaries of each subcatchment area are field GPS-delineated.
- c) Subcatchment Drainage Network Delineation and Type The unique drainage network patterns that characterize the way overland flows within each subcatchment area are shed or conveyed, are GPS-mapped in the field. These drainage features may include but not necessarily be limited too: A) Ephemeral channels that only convey flows during heavy precipitation events, which typically look like tree-like, or dendritic structures, which is a common drainage pattern characteristic of watersheds within RVC.
- d) Depression Storage The mapping of macro depressions or trap-lows within each catchment area is critical and is frequently overlooked or downgraded in the field data acquisition process as it can take a considerable amount of time to identify, characterize, and delineate. These features can however be effectively harnessed for the natural hydrologic and hydraulic functions that they provide. They can, by themselves, or through the accentuation of their inherent hydrologic functions, be used as natural LID bio-infiltration zones to capture, store, infiltrate, attenuate or buffer, and release overland stormwater flows after they fill up, collectively providing enough cumulative storage capacity to reduce the risk of insitu and/or downstream flooding. Most LiDAR-generated topographic maps do not accurately capture these features, and so they are frequently missed or overlooked. In some cases, future homes and driveways can be positioned in a manner that can render what might at first appear as a non-internally drained catchment, into an internally drained catchment that precludes overland stormwater flows from being released to the larger watershed area. The dimensions of these features are coded and mapped or delineated in the field using GPS, and photographed, and an estimate of their storage volume made. Due to the critically important value that these natural systems provide, the layout design for the driveway and future home(s) should preserve and work in harmony with them to optimize the hydrologic and hydraulic functions of these nature system provide.

- e) Cover Types The cover of a catchment area represents a critically sensitive parameter that can significantly affect the rate of overall runoff from a catchment area. Cover types include both hard and soft or natural surfaces, that range from vegetation, such as the poplar forests and woody and non-woody or herbaceous understory vegetation that is characteristic to this pot and kettle area of Bearspaw, to roof tops, gravel and paved driveways and municipal roads, respectively. Due to the importance of natural cover types, the design of the future home and driveway should be configured in a manner that minimizes the removal of healthy overstory and understory vegetation. This would include vegetated riparian areas that would naturally buffer protect said sensitive pot and kettle lake features.
- f) Pots, Kettles, Wetlands & Riparian Areas Pots, Kettles, and wetlands and riparian areas are common natural water features within this area of Bearspaw. Where such features are located within a proposed country residential subdivision development, which is not the case for the proposed development, these features can be naturally interfaced to ensure that runoff volumes and rates are controlled to what predevelopment levels would have been, to ensure that these systems are protected or buffered in the wake of development. As such, a waterbody setback assessments and erosion and sediment assessments may be required to evaluate and provide site-specific LID prescriptions to ensure the sustainable protection of said natural pot and kettle and wetland systems.

#### 5. Hydrologic Modeling

Computer-based hydrologic modeling is routinely used to streamline and standardize the data analysis process used as a tool to attempt to forecast or predict the hydrologic response of a proposed development area under preand-post-development site conditions. The computer-based model attempts to reflect or mimic the characteristic hydrologic response or behavior of each subcatchment area under both natural and future developed conditions. If the field data is not accurate then the hydrologic model will not accurately reflect reality regardless of how convincing the graphical output may appear. As the old computer adage goes: "Garbage in garbage out!" The model is ultimately used to estimate the pre-and post-development peak volumes and peak rates of overland stormwater flows using what is called a synthetic or ideal storm based on a real storm for the largest rainfall event that is likely to occur at least once in 100 years but reduced to occur over a 24-hour period, called the 24-hour, 1:100-year Chicago event. Additionally, real rainfall data, collected over the period of record, approximately 60 years from the Calgary International Airport, is also used and the results compared to the results of the synthetic storm, using the more onerous of the results for LID design purposes.

#### 6. Low Impact Development (LID) Design

Following the computer-based hydrologic modeling, the possible LID designs conceptualized during the field data acquisition process or during the building of the field hydrology model, are initially designed and a hydraulic model created to evaluate the hydraulic performance of each possible design. **Section 5.3.2** below discusses LIDs in detail as they relate to development within the subject quarter.

#### 7. Stormwater Management Planning Report

As a final step in the stormwater management planning process, a stormwater management planning report is prepared that describes each element of the stormwater management planning process, including the hydrologic modeling analysis results, the site-specific LID constraints and criteria, the LID design and hydraulic performance analysis results, where such is required, ending with the conclusion and recommendations and professional engineering certification.

#### 5.3.2 Low Impact Development (LID)

Low Impact Development (LID) is a term used in Canada and the United States to describe a land planning and engineering design approach to manage stormwater runoff as part of the green infrastructure. LID emphasizes conservation and use of onsite natural features to protect water quality. This approach implements engineered small-scale hydrologic controls to replicate the pre-development hydrologic regime of watersheds through infiltrating, filtering, storing, evaporating, and detaining runoff close to its source; that is, managing precipitation (i.e., snowfall and rainfall) at or close to the location where it falls.

The basic principle of LID is to use nature as a model and manage rainfall at the source. This is accomplished through sequenced implementation of runoff prevention strategies, runoff mitigation strategies, and finally, treatment controls to remove pollutants, where that may be required. LID employes a strategic design process to create a sustainable site that mimics the undeveloped hydrologic response of a site to a precipitation event. It requires a prescriptive approach that is appropriate for the proposed land use; that is, it is critical that the time be spent to build, as a foundation, an accurate field hydrology model that reflects the physical characteristics of a proposed development site.

The following 5 core or key principles underpin low-impact development:

- 1. <u>Conserve</u> natural areas wherever possible.
- 2. <u>Minimize</u> the development impact on hydrology.
- 3. <u>Maintain runoff rate and duration from the site</u>.
- 4. <u>Scatter</u> integrated management practices (IMPs) throughout your site IMPs are decentralized, microscale controls that infiltrate, store, evaporate, and/or detain runoff close to the source.
- 5. <u>Implement pollution prevention</u>, proper maintenance, and public education programs.

Figure 6 below conceptually illustrates the <u>5</u> key principles or elements of low-impact development.



Figure 6: Key Elements of LID (Source: Low-impact development (U.S. and Canada, Wikipedia)

Within this forested area of Bearspaw, LIDs tend to be small and therefore cost-effective, particularly because runoff volumes and peak runoff rates can be effectively managed by limiting the removal of healthy trees, understory vegetation, natural wind or deadfall (i.e., Large Woody Debris (LWD)) that would in said state help too: a) intercept rainfall; b) preserve natural surface depression storage; c) increase surface roughness to impede runoff rates; and d) provide evapotranspiration, etc.

Stormwater management planning within the proposed Kettlehole Springs at Bearspaw will be designed as a hybrid system comprising Low Impact Development (LID) strategies and integrated water resources management strategies or Best Management Practices (BMPs). Further, stormwater management within the area will be in accordance with the recommendations of the Bearspaw Master Drainage Plan and the Nose Creek Watershed Water Management Plan, unless within the stormwater management planning process, internally drained areas area identified and can effectively be used to manage post-development stormwater runoff volumes. LID strategies are an effective and environmentally sustainable means to effectively manage post-development peak flow rates and runoff volumes as it manages precipitation at the

location where it falls by promoting infiltration, subsequently reducing, or eliminating dependence upon a stormwater conveyance system(s). For LID strategies to successfully manage stormwater flow rates and volume control, they must be an essential consideration in the overall subdivision and development concept for the proposed Kettlehole Springs Community. Development within the Planning Area will:

- Preserve the existing landform in the subdivision and development concept and minimize extensive stripping and grading during the development of the Planning Area.
- Preserve and protect existing natural depressions in the landscape and utilize these natural depressions in the overall design of the stormwater management system.
- **4** Maintain the existing vegetation cover throughout the Planning Area.
- ↓ Maintain Large Woody Debris (LWD) on the forest floor.
- **4** Create bio-infiltration zones within the stormwater management system.
- 4 Adopt a development strategy focused upon the reduction of impermeable areas through Planning Area; and
- Fromote the use of rain barrels and cisterns to retain and recycle stormwater.

In respect to LID principles, stripping and grading of the residential lots will be kept to a minimum. In addition, the majority of the existing depression areas, and overland flow paths will be maintained and preserved by rights-of-way, easements and/or restrictive covenants registered against the titles of the lots containing the local depressions and natural swales.

#### 5.4 Integrated Water Resources Management (IWRM)

IWRM is a holistic approach to water use and management. As such, it departs from the traditional and fragmented approach in which different sectors implement water projects independently, frequently with overlapping responsibilities. It is an integrated, systematic, and sustainable approach to water resources management that factors in the limited nature of water resources and the effects of negative impacts on this resource. IWRM "promotes the coordinated development and management of water and related resources for equitable social and economic development without compromising the sustainability of vital ecosystems" (Global Water Partnership, 2000). IWRM is therefore an approach to the management of water resources that fits into the broader context of sustainable development, whereby it strongly emphasizes ecosystem sustainability, social equity, and economic efficiency. This relates directly to the ecological, social, and economic value of water resources.

The Earth's freshwater resources are under increasing pressure from human social and economic development activities across the globe. In Alberta, and elsewhere in western Canada, we are currently experiencing a severe drought and Alberta Environment and Parks (AEP), Drinking Water Division, has expressed that they are extremely concerned about the growing shortage of water. In Rocky View County,

and in other counties that rely upon groundwater as their sole source of water, serious consideration and action steps need to be taken to invoke reliable, proven technologies or methodologies that will help to protect our most precious, life-giving, natural resource.

According to Gumbo and Van der Zaag (2001), there is a growing awareness in the global community that:

- 1. Freshwater resources are limited.
- 2. The limited freshwater resources are becoming polluted, making them unsuitable for human consumption and use, and for ecosystem sustenance.
- 3. There are many competing needs and demands for water in society.
- 4. Not everybody has access to safe freshwater resources.
- 5. Often, some technologies used to control water (e.g. dams and reservoirs) may have negative effects on the environment.
- 6. There is a strong interrelationship (i.e., Groundwater-Surface Water Interaction) between surface and groundwater resources.

The realization of the above interrelated issues calls for a coordinated, comprehensive, and holistic approach to water resources management that takes into account all the above aspects.

The idea of IWRM emerged from the Dublin Statement on Water and Sustainable Development (United Nations, 1992b) which was adopted on 31 January in 1992 in Dublin, Ireland during the International Conference on Water and the Environment (ICWE). The statement emphasized the scarcity and misuse of global water resources as a serious and growing threat to sustainable development and environmental protection, posing risks to human health and welfare, food security, industrial development, and ecosystems. The Statement came up with four guiding principles, which form the basis of IWRM, and are articulated as follows:

- 1. Freshwater is a finite and vulnerable resource, essential to sustain life, development, and the environment.
- 2. Water development and management should be based on a participatory approach, involving users, planners, and policymakers at all levels.
- 3. Women play a central part in the provision, management and safeguarding of water.
- 4. Water has an economic value in all its competing uses and should be recognized as an economic good.

Notwithstanding the value and importance of each principle, the practical implementation of principle #1 within the context of the land redesignation and subdivision processes, will form the basis for discussing several effective water resources management strategies, that if implemented within the subject quarter and potentially within the County as a whole, could position Rocky View County at the forefront in Canada, realizing the benefits of IWRM while setting a precedence for other municipalities and counties across the country to follow its lead. **Figure 7** below conceptually illustrates the value or benefits of IWRM that were realized and expressed from the experiences of a group of Stakeholders within an area of California that was heavily impacted by decades of severe drought, an experience that they only recently emerged from, and that we, in Alberta, are now experiencing, again.



Figure 7: IWRM Benefits (Modified from Source: bayareairwmp.org, January 26, 2024)

The challenge of water resources management is balancing the use of water resources for human livelihood activities and the protection and conservation of water resources to enable them to sustain their functions. Water resources should therefore be used wisely for social and economic development, with due consideration for sustainability of the water resource base and the environment (ecosystem) for future generations. Water resources persist in natural ecological systems that enable the regeneration of the freshwater resource through the water cycle. Aquatic and terrestrial ecosystems in the water catchment area(s) and upstream are vital for maintaining the water cycle, surface, and groundwater recharge, as resources for human livelihoods and as natural habitats for wildlife. Human development activities are usually associated with negative impacts on the environment that threaten sustainable development and sustainable water resource supply. As such, an integrated approach to water resources management enables stakeholders to identify and analyse unsustainable (unfavourable and undesired) development activities and allows the design of sustainable water resources management systems, such as LIDs, that integrate human societal needs (socio-economic development) and environmental concerns (ecological and hydrological integrity) to be facilitated for the benefit of both.

The following sections present several time-tested and proven integrated water resources management strategies related to the implementation of integrated wastewater resources management in Canada and the United States, for the integrated treatment, recycling and reuse of wastewater as a valuable resource, the integrated sustainable management of groundwater resources, and an integrated sustainable management strategy from the management of stormwater for the proposed conceptual future shadow lot and transportation network presented in **Appendix A** below.

#### 5.4.1 Integrated Sustainable Wastewater Management

As of 2017, all new lots within Rocky View County are required to be serviced with a BNQ-certified packaged wastewater treatment plant. As such, the Applicant, for and on behalf of the landowners of the proposed 3-Lot Country Residential Subdivision, prepared a Level 3 Model Process Assessment, also called a Private Sewage Treatment System (PSTS) assessment. The Model Process Assessment (MPA) was originally developed by the Province of Alberta to help streamline and standardize the data acquisition, data analysis and reporting processes, to minimize or pre-emptively mitigate against potential environmental impacts associated with the failure of wastewater treatment systems that was historically common in environmentally sensitive areas. A PSTS is normally required as part of the subdivision rezoning or land redesignation application package to assess the capability of the subsurface environment within each lot to buffer the hydraulic loading and polish the secondary treated wastewater effluent (i.e., greywater treatment) generated from each future house through the County-mandated Packaged Wastewater Treatment Plant, an expense that will be incurred by each future lot owner at the time that they construct their home. It is noteworthy to mention that this area of the County is generally known to be acceptable for the disposal of

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secondary treated wastewater effluent, and that within those areas with well established mature forests where the forest floor has had enough time to build up a thick enough organic layer, called the LFH layer, the use of an "At-Grade" surface field treatment system, following the primary treatment (i.e., solids removal) and secondary treatment, may be more cost-effectively accommodated. The results of the Level 3 PSTS indicate the proposed future lots will support the use of PSTS for the treatment of wastewater.

Notwithstanding the continued use of the proven onsite wastewater treatment practices within the County, it is respectfully proposed that due consideration be given to the implementation of an integrated wastewater treatment system that allows for the treated wastewater to be recycling and reused - an integrated, long-term environmentally sustainable water supply strategy, this in an effort to reduce the pressure on the underlying groundwater resources or supplies that are, under these drought conditions, conceivably being depleted at a rate greater than the recharge rate.

#### 5.4.2 Water Reuse in Canada and United States

Water reuse is still very much in its infancy in Canada and the United States, primarily because of the underlying fears and the associated stigma...or strong feelings that most people have around the adoption of wastewater treatment for the recycling and reuse of water, despite the unprecedented need to creatively solve the myriad of water resources-related challenges that we are ongoingly faced with today. Thus, the adoption of water reuse is imperative for the future of Canada, the United States, and globally, notwithstanding that Canada enjoys vast freshwater resources in some areas of the country. However, this is certainly not the case for everyone in Canada, and certainly not in many parts of the United States and in many countries around the world, and that is certainly the case in Alberta and in parts of British Columbia. There are, surprisingly, places in Canada and the United States that suffer from a lack of safe, reliable drinking water...and that number is predicted to only grow in the years ahead as the population expands and places more demand on our most critical natural resource - water. Thus, it is evident to our team that we need to begin to embrace water reuse technologies in both Canada, the United States, and globally. As such, we will respectfully introduce a proven 50-year old packaged wastewater treatment system that treats between 95 and 98% of the water in wastewater to California Title 22 Drinking Water Standards, the only system of its kind in the Northern and Southern Hemisphere, that our US and Canadian team are currently launching into Canada.

#### 5.4.3 Wastewater Treatment, Recycling & Reuse Technologies

#### THE BIO-PURE® TECHNOLOGY

After several years of working with our US business partner, JMCS Services LLC, Western Water Resources (WWR) Inc. is undertaking, with the support of our US partner, the launch of the Bio-Pure® Packaged Wastewater Treatment System (PWTS) into Canada, a proven method for processing sewage wastewater and producing reclaimed water that is safe for environmental discharge and/or a range of



beneficial uses. The basic technology is an Intermittent-Cycle Extended-Aeration (ICEA) "batch process" that combines anaerobic & aerobic digestion, disinfection, clarification, and filtration to digest and remove the organic components in the wastewater. Routine testing of the effluent from existing Bio-Pure® systems

has confirmed that the reclaimed water meets or exceeds the most stringent water quality standards, California Title 22 Drinking or Potable Water Standards, (Biochemical Oxygen Demand [BOD5], Total Suspended Solids [TSS], coliform count, turbidity, and total nitrogen [N]) for protection of aquatic life (EPA fish bioassay test). Because Bio-Pure® systems are completely enclosed, they produce no odor. Extensive recycling of wastewater in a Bio-Pure® system minimizes sludge



production. As such, any remaining sludge can be collected, dried, and used as a soil amendment or disposed of as non-hazardous waste. Bio-Pure® systems can be designed to accommodate wastewater treatment needs of <1,000 gpd to >500,000 gpd, can be located either above-ground (preferred) or below-ground, and the entire process is controlled by a state-of-the-art CPU operating system. Systems of <50,000 gpd can be operated remotely and do not require an on-site operator.

The pioneering implementation of the Bio-Pure Packaged Wastewater Treatment System offers a proactive water reuse solution to directly reduce the burden on impacted communities...thus creating a safe source

for water when the situation demands it. In Counties and Municipalities that rely upon groundwater, the ability to treat, recycle and reuse between 95 - 98% of the water in wastewater offers an exciting new dimension in the world of integrated water resources management, significantly reducing the impact on groundwater resources and sustainably extending the life of this vulnerable natural resources for generations.

#### **BRIEF HISTORY**

The Bio-Pure® Package Wastewater Treatment System (PWTS) was developed and refined over the past 50+ years, was patented in 1972, was NSF (National Sanitation Foundation) certified in 1973 and has an extensive track record of serving a broad range of communities worldwide. Significant upgrades have been made over the years to the system's operating controls, and the disinfection, denitrification, and filtration processes. More than 2,000 Bio-Pure® systems have been installed to treat sewage wastewater for residential communities, commercial buildings, golf courses, RV parks and campgrounds, schools, pipeline operations, shopping centers, hotels, agricultural processors, and oil platforms in the Gulf of Mexico.

#### THE BIO-PURE® SOLUTION

The Bio-Pure® PWTS is a highly cost-effective and environmentally compatible solution for new developments – residential, RV parks and campgrounds, golf courses, off-grid resorts – in locations that lack access to a municipal sewage treatment facility (Publicly-Owned Treatment Works [POTW]), or when construction of a sewer connection line to a POTW is not economically feasible, or when installation of a traditional septic/drain field system is either not feasible or prohibited for environmental reasons, or when an antiquated septic-drain field system or cesspool needs to be replaced. A Bio-Pure® PWTS is also a perfect solution when temporary sanitation is needed such as man camps, construction sites, refugee camps, or when protection of lakes, rivers, and other water bodies, such as the small, shallow, environmental pot and kettle lakes and wetlands or in sensitive marine environments, such as offshore oil platforms or oceangoing ships, is essential. Another emerging application of Bio-Pure® systems is the processing of agricultural animal waste as an environmental protection measure.

The Bio-Pure<sup>®</sup> PWTS is an innovative, cost-effective onsite wastewater treatment solution for the recycling and sustainable reuse of water – a <u>gold</u> standard in water reuse technology - a Model for Economic Diversification, Resiliency, and Social and Environmental Sustainability.

The timing for the launch of the Bio-Pure® Packaged Wastewater Treatment System could not come at a better time, so long as it is introduced through "a functional structure of standards, policies, and governance", thus presenting us with the opportunity to work together through this process to help our governing bodies, along with our industry colleagues, to create the case for the widespread adoption of water reuse in Canada, the US, and globally. (Modified from "Water Isn't Everywhere, WATERCANADA, September/October 2022)

#### 5.4.3.1 Communication with Alberta Environment and Parks (AEP)

Preparatory for the Canadian launch of the Bio-Pure<sup>®</sup> PWTS, we reached out to speak with the Manager of the Alberta Environment and Parks (AEP) Calgary branch, to seek his direction to help us launch our technology. He indicated that because of its 50-year proven track record and supporting water quality data, that so long as professional engineer was willing to certify its installation and track its performance with supporting data, then AEP would accept that. He suggested that we contact their Drinking Water Division in Edmonton, as they are extremely concerned about the ongoing drought that we are experiencing in Alberta.



#### 5.4.3.2 A Private-Public Partnership (PPP) Model

A public-private partnership (PPP) model is a cooperative arrangement between private and public sectors that enable government and business to come and work together on a project that creates an environment to creatively solve problems that both the private and public share and have a vested interest in solving. PPPs have been employed for a range of infrastructure projects, including water and wastewater treatment systems. We respectfully suggest for the County's due consideration, the development of a holistically sustainable, integrated water resources management PPP model, to pioneer, as part of a future suite of environmentally sustainable strategies, the development of a Kettehole Springs Community Wastewater Treatment, Recycling and Reuse System, by invoking the Purple Piping legislation that is already in place in Alberta for the recycling and reuse of non-potable water, notwithstanding that the Bio-Pure produces potable water that exceeds said California Title 22 Drinking Water Standards.

The PPP model would include the creation of a PPP Utility Corporation to manage the treatment system(s) with this community; and later, the setup of a PPP Bio-Pure<sup>®</sup> PWTS Assembly Plant within the County to service the balance of existing and new future communities within the County, Alberta, and Western Canada. The PPP would benefit the County financially through the sale of systems, which would be provided to the public sector at a discounted rate, and to the private sector at full retail, with each operational system generating a monthly residual cashflow revenue stream from the rate payors, which in part could be used to develop a Perpetual RVC Growth Fund (PCGF) for the express purpose of investing back into the County to stimulate its continued growth – attracting individuals, families, and business that will help to foster building a holistically sustainable County.

#### 5.4.4 Integrated Sustainable Groundwater Management – Managed Aquifer Recharge

Managed aquifer recharge (MAR) is the process of taking water, typically excess surface water, like stormwater, and putting it into an aquifer for later use. MAR is fairly broad in its scope, with its roots dating back to the ancient Persians, who captured water coming down off the mountains, detained it, and attempted to get it to percolate into the ground.

Any way you can slow down surface water or capture it, or even in some cases treated wastewater, and inject it into underlying aquifer(s), that represents managed aquifer recharge. This is very common in many parts of the United States, particularly in areas with arid and semi-arid climates in the southwest, that have large-scale Aquifer Storage and Recovery (ASR) programs.

Within MAR, there are subsets, including flood MAR, which captures flood flows, detains the water in surface basins, then allows it to recharge aquifers. MAR processes are increasingly a best management practice with new developments in sub-watersheds and greenfield areas, where efforts are being made to ensure the development doesn't "shortchange" or deplete aquifers and nearby water features that depend on groundwater. Another subset within MAR is ASR, where instead of using recharge basins, treated water is injected into aquifers using flow wells. **Figure 8** below illustrates a conceptual model of the aquifer storage and recovery (ASR) system used by the Waterloo Region in Ontario, Canada.



Figure 8: Conceptual ASR Model for Waterloo Region, Ontario (Source: Regional Municipality of Waterloo)

The process of injection surface water or treated wastewater can appear like we are short-circuiting the hydrologic cycle, but it can, as stated by Don Corbett, senior hydrogeologist for the Regional Municipality of Waterloo, a process of "actively managing the hydrologic cycle in a way that we're taking advantage of every little bit of surplus water that is available to us, noting that eventually it all finds its way back down to the bottom of the cycle." So, effectively, we are recycling the water a few times as it makes its way through the cycle and then using it and then allowing it to go where it would naturally end up.

Waterloo Region's Mannheim Water Treatment facility has an ASR system and is located on a moraine – a natural geographic feature of coarse sand and gravel, with an aquifer underlying it. It's an integral part of their long-term water plan for the region, which has relied on groundwater for hundreds of years.

In the context of integrated water resources management within the subject quarter, this area within Bearspaw and in the Bearspaw area in general, is a large aquifer recharge area, and so this opens up the possibility of being able to manage the surface water resources, including surplus surface or stormwater, and potentially wastewater treated to said potable standard, in a manner that allows the underlying aquifers to remain in a recharged state, providing a sustainable supply of water, especially during periods of drought as the population continues to grow and places an even greater demand on the resource. So, having such a surplus stored supply, will allow us to work our way through drought periods by having additional water banked in an aquifer, which we can draw on as needed.

Crobett further said: "Lots of people are surprised that we have an ASR system here, but it's something this community got behind as part of our long-term water supply strategy," It's preventing us from having to spend a lot more money to expand our treatment plant and look for new water sources, and even postpones the need for a pipeline. It gives us a lot of flexibility in the way we operate our water supply system, so that's a huge benefit."

Generally, of the thousands of [MAR] projects that have been implemented worldwide, very few are in Canada, but the interest is increasing. Many examples of U.S. MAR systems could be looked at as models. Tim Parker, president of Sacramento-based Parker Groundwater and a nationally recognized groundwater expert, has been working in the MAR space for years and offers a list.

Parker wrote about the Orange County Water District (OCWD) in his article "Managed Aquifer Recharge: California and Beyond" for the September 2017 issue (Vol 190, No. 5) of Water Resources Impact, an American Water Resources Association publication. The OCWD recharges approximately 300,000 acrefeet per year, using both percolation ponds and injection wells supplied by advanced treated recycled water, stormwater flows, and imported water. This replenishes the basin and maintains a hydraulic barrier along the coast to minimize seawater intrusion.

"[There] needs to be a 'paradigm shift' in how we think about water management," Parker says in an interview, explaining that current thought is to use available surface water first then groundwater when less surface water is available. "I believe we need to redesign our water supply systems, so we incorporate refilling aquifers – MAR – continuously when surface water is available, using all the methods – from direct to indirect, on stream, off stream, injection, and infiltration – in lieu of surface water use."

#### 5.5 Future Conceptual Shadow Lot and Transportation Network Plan

A future conceptual shadow lot and transportation network plan was developed to illustrate what the subject quarter could look like in its fully developed, built out state. With the increase in future homes, driveways and a municipal road network or system, the integration of LIDs along with environmentally sustainable road construction best management practices that will ensure that the natural drainage patterns that would typically be severed, are maintained. Frequently, from our experience, the use of ditches can unknowingly cause drainage issues by transporting or conveying water at accelerated rates and volumes of stormwater runoff to locations that would not otherwise experience those increased volumes and rates of stormwater, overloading natural systems that do not have the capacity. The conceptual plans are given in Appendix A.

#### 6 SUBJECT LANDS WITHIN KETTLEHOLE SPRINGS OF BEARSPAW

#### 6.1 Site Location

The proposed 3-Lot Country Residential Development, hereinafter referred to as the Subject Lands, is located approximately 0.53 mi (0.874 km) west of Rocky Ridge Road, as illustrated in **Figure 9** below.



#### 6.2 Conceptual Development Plan

The existing 7.19-ac (2.91 ha) parent parcel of Plan 8911077, Block 15, within SW1/4 32-25-02 W5M. Rocky View County has been proposed for subdivision into three (3) lots, comprised of the existing lot with a house on the south side of the subject Lands, and the proposed new lots, Lot 1 (West) and Lot 2 (East), on the north side, immediately south of and adjacent to Meadow Drive.

Future access into the proposed new country subdivision residential development lots will be via the construction of two new driveways off of Meadow Drive immediately south of the northern property boundary, as conceptually illustrated in Figure 10, right.



Figure 10: Conceptual Site Development Plan

For clarification purposes, any reference to the "Site", "Subject Area" or "Subject Lands" in this report will describe the existing parent parcel.

#### 6.3 Current Land Use

The subject lands are currently designated as Residential, Rural District (R-RUR). The purpose of this district classification is stated thus in Section 317 of Rocky View County Land Use Bylaw:

## "To provide for residential uses in a rural setting on parcels which can accommodate limited agricultural pursuits."

R-RUR allows for a minimum parcel size of 1.61 ha (3.95 ac) and is thus stated in Section 319 of said Land Use Bylaw. The zoning general is shown in the land use map in **Figure 11** below.



Figure 11: Zoning General (Modified from Rocky View County TWP. 25-2-W5M, Land Use Map No. 56-North, Jan. 18, 2024)

#### 6.4 Adjacent Land Use

The subject property is surrounded on the north, south, east, and west by Residential, Rural District (R-RUR) lots that vary in size but are similar to what is being proposed in this instance as shown in **Figure 12** below. We observed that the lands immediately to the northwest and southeast are designated Residential, Country Residential District (R-CRD), the redesignation land district that the landowner is seeking.



Figure 12: Adjacent Land Use (Modified from Rocky View County TWP. 25-2-5M, Land Use Map No. 56-North, Jan. 18, 2024)

#### 6.5 Title Search

A title search was conducted in October 2023, on the Government of Alberta Spatial Information System (<u>https://alta.registries.gov.ab.ca/spinii</u>). The title confirms that Sam Amini and Mansoureh Rashidi are the current owners of this property.

#### 6.6 Comment on County Plan Policy

Any Subdivision of the subject property will need to align with the amended County Plan. The application will need to consider the impact that subdivision and further development will have on the surrounding neighbors, roads, and the environment. Attention to stormwater management planning, water supply and wastewater management in a subdivision application will be critical to garnering County approval.

#### 6.7 Country Residential Development Policy Comments

As outlined in this (C-CRD) land use district the parcel sizes are to be 1.98 acres or more in size and should provide for residential uses in a rural setting on small parcels which cannot accommodate agricultural pursuits. There is every reason to believe that currently this site will qualify for C-CRD lots.

#### 6.8 Water Servicing

Connection to a water treatment and distribution system is preferred, when feasible. In this area water treatment is a possibility as there is a water line that runs along the frontage of this property. Based upon our experience of developing in the area, the County will require that all new lots created be hooked up to that existing water line. As such, the landowners have, as part of their redesignation, provided a letter from the Rocky View Water Co-op verifying that they have a sufficient water supply to meet the projected water supply needs for the additional two (2) lots. **Figure 13** below illustrates the existing waterline along Meadows Drive, where the arrows indicate the approximate location of the waterline based on portion of an image extracted from Roky View Water Co-op Ltd. Treated Water Distribution System Key Plan.



Figure 13: Rocky View Water Co-op Distribution System

#### 6.9 Vegetation and Wildlife Polices

While this is an ecologically important area, the County Plan and LUB will generally allow development within these areas provided there is sufficient consideration to minimize any negative impact on vegetation and wildlife. The majority of the vegetation on this site appears to be predominately naturally occurring trembling aspen and is not situated in the areas where the proposed driveways and future houses would be situated, thus there will be no need to remove vegetation, as illustrated in the conceptual development plan in **Figure 13** above. As a result, it is highly unlikely that wildlife would be adversely impacted, particularly as wildlife in the Bearspaw area have, for many generations, adapted well to the influences of country residential development. While wildlife abounds in the area, most utilize the open fields to forage, and nearby coulees for shelter and protection from predators. It is our general opinion that development of this site will not pose a significant risk to neither vegetation nor wildlife. Thus, no Biological Impact Assessment (BIA) was requested as part of this application.

#### 6.10 Lot Sizes & Density

Lot sizes are controlled by policies both in the County Plan and the LUB. The maximum density for lots in this area is based on a maximum density of one parcel for every 1.98 acres of land. The only exemption to this is if there is a piped potable water system and/or a piped wastewater treatment system. Since this area has only piped water, the maximum density will remain at one parcel per every two acres.

#### 6.11 Municipal Reserve

During any development, the developer is required to provide 10% Municipal Reserves (MR) for future pathways, parks, schools, and other public spaces. Normally MR is taken in one of four possible ways:

- 1. Cash in lieu of 10% (established by averaged recent sales of similar undeveloped raw land sales)
- 2. Dedication of 10% of land (in this case 1.75 acres)
- 3. Deferred MR to a later subdivision
- 4. A combination of the above

MR is a decision of the subdivision authority (in this case it is Rocky View County Council). There is no deferred reserve caveat (DRC) placed on title, so we don't know for sure if MR has been dealt with. However, it is hoped that MR has been dealt with, as that will be a substantial savings on the development costs of any proposed development. The only way to be sure is through the subdivision process itself.

## 7 CONCLUSIONS

The conclusions for the proposed future country residential subdivision and subject quarter section are respectfully presented below to Rocky View County Council, as follows:

#### **Current and Adjacent Land Use**

- 1. The subject lands are currently designated as Residential, Rural District (R-RUR).
- 2. The subject property is surrounded on the north, south, east, and west by Residential, Rural District (R-RUR) lots that vary in size but are similar to what is being proposed.
- 3. The subject property is situated adjacent to lands on the northwest and southeast that are designated Residential, Country Residential District (R-CRD), the redesignation land district that the landowner is seeking, and are consistent with the minimum 2 acre lots for this designation.

#### Wastewater Treatment (Subject Lands and Subject Quarter)

- 1. A Level 3 Model Process Assessment (or Level 3 PSTS) was completed in the fall of 2023 to within each of the proposed two new lots to confirm the suitability of each site to support the use of a PSTS. Both lots will support the use of a PSTS.
- 2. A proposed future community wastewater treatment, recycling and water reuse system, using Bio-Pure PWTS, the first and only packaged wastewater treatment system that will treat between 95 98% of the water in wastewater to California Title 22 Drinking Water Standards is proposed for the development to reduce the future demand or pressure on the underlying aquifers as the population with the subject quarter continues to grow to its full future buildout capacity, as part of an integrated water resources management strategy to protect and sustain the underlying groundwater resources.
- 3. We have proposed the creation of a Private-Public Partnership (PPP) with Rocky View County for the future launch and assembly of the Bio-Pure PWTS in the County and in Western Canada, as part of implementing an Integrated Water Resources Management strategy and developing a residential revenue stream to support the County with the realization of its Vision.

#### Stormwater Management Planning & Low Impact Development (LID) Design

- 1. Future Stormwater Management Planning and a Low Impact Development (LID) will be required at the Subdivision stage of the land development process, following the approval of the land redesignation package.
- 2. As part of the development of the future lots and driveways, the following environmentally sustainable practices are recommended for implementation within the proposed subject land development and for all future development within the subject quarter:

- a. Preserve the existing landform in the subdivision and development concept and minimize extensive stripping and grading during the development.
- b. Preserve and protect existing natural depressions in the landscape and utilize these natural depressions in the overall design of the stormwater management system.
- c. Maintain the existing vegetation cover and minimize, as reasonably practicable, the removal of healthy overstory and understory vegetation.
- d. Create bio-infiltration zones within the stormwater management system.
- e. Adopt a development strategy focused upon the reduction of impermeable areas through Planning Area; and
- f. Promote the use of rain barrels and cisterns to retain and recycle stormwater.

#### **Integrated Groundwater Resources Management**

- The future development of a Managed Aquifer Recharge (MAR) as part of an Integrated Water Resources Management strategy (IWRM), integrating the development of an Aquifer Storage and Recovery (ASR) system to collect and treat surplus stormwater runoff to a potable standard, which could be facilitated through the Bio-Pure PWTS, as a long-term sustainable groundwater supply strategy to reduce the pressure or demand on the underlying aquifers, particularly during periods of droughts.
- 2. Numerous ASR programs exist in the United States, and in Canada, in the Municipal Region of Waterloo, Ontario.

#### **Environmentally Sustainable Road Network**

1. A future conceptual plan for an integrated, environmentally sustainable road network was created with the understanding that the road will be constructed employing environmentally sustainable road construction practices, that could include recycled asphalt and employing LIDs to minimize the stormwater generation footprint.

#### **Community Support**

- 1. A total of 12 letters of support were provided by the adjacent landowners supporting the future proposed 3-Lot Country Residential Subdivision Development with the subject lands.
- 2. The majority of the supporting landowners expressed an interest in subdividing in the future, and one has already initiated this process.

### 8 CITED REFERENCES

- 1) BEARSPAW AREA STRUCTURE PLAN, Bylaw C-4129-93, Adopted January 18, 1994, Municipal District of Rocky View No. 44, Department of Planning and Development.
- 2) Carolyn Camilleri, Managed Aquifer Recharge, Groundwater Magazine, September 9, 2019.
- 3) Current Land Tile Certificate for Sam Amini and Mansoureh Rashidi, November 2023.
- 4) Rocky View County COUNTY PLAN, BYLAW C-7280-213, AMENDED NOVEMBER 6, 2023
- 5) SIWI Stockholm International Water Institute, Manual 1, Principles and Practices of Integrated Water Resources Management, Workplace-based Professional Training. Copyright 2020.

## **APPENDIX A**

Conceptual Plan for Integrated, Environmentally Sustainable Lot & Transportation Network





## **APPENDIX B**

Adjacent Landowner Support Letters



#### LAND USE REDESIGNATION NEIGHOUR SUPPORT LETTER

#### July 6, 2023

#### Dear Neighbour:

This letter is to inform you that your neighbour, Sam Amini, is proposing to redesignate their property, situated at 24141 Meadow Dr. NW, with Legal Address of Lot 2, Block 14, Plan 121 2864, Rocky View, County, Alberta, from R2 to R1, to accommodate subdividing their land into 3 lots, as illustrated below.

As such, Sam Amini would greatly appreciate your support by filling in your name and address below and signing and dating it.

Day of Full name), am a landowner at Meadow Drive (address), and I have no objection to this land use 24185

redesignation application.

Date: July 21 2023 Signature

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A Globally Green Corporation – Engineering Holistically Sustainable Communities

Suite 200 – 1201 5 St. SW, Calgary, Alberta, T2R 0Y6 Phone: (403) 614 – 7372; Email: v.:loous diversion

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As such, Sam Amini would greatly appreciate your support by filling in your name and address below and signing and dating it.

I, DAVE + LESCIE SCABAR (Full name), am a landowner at

24131 Meadow Drive (address), and I have no objection to this land use

redesignation application.

Caba Date: A Ug 10/23 Signature an

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Suite 200 – 1201 5 St. SW, Calgary, Alberta, T2R 0Y6 Phone: (403) 614 – 7372; Email: <u>v néout@ww.nnc.co</u>

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As such, Sam Amini would greatly appreciate your support by filling in your name and address below and signing and dating it.

1, SHAYNE FOSTER (Full name), am a landowner at 24/70 MEADER (Regulater Control of this land use

redesignation application, Date: Aug 27/23 Signatur

A Globally Green Corporation - Engineering Holistically Sustainable Communities!

Suite 200 - 1201 5 St. SW, Calgary, Alberta, T2R 0Y6

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As such, Sam Amini would greatly appreciate your support by filling in your name and address below and signing and dating it.

24064 Merry OW DV N. W (address), and I have no objection to this land use 1. C. Buiece

redesignation application.

Vente Galy 17/23 Signature:

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A Globally Green Corporation - Engineering Holistically Sustainable Communities!

Suite 200 – 1201 5 St. SW, Calgary, Alberta, T2R 0Y5

Phone: (403) 614 - 7372; Email: videout @

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As such, Sam Amini would greatly appreciate your support by filling in your name and address below and signing and dating it.

17 Sandhu (Full name), am a landowner at Macidow Dr. Rockying (address), and I have no objection to this land use redesignation application. Date: July 12 2023 Signature:

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A Globally Green Corporation – Engineering Holistically Sustainable Communities!

-Suite 200 - 1201 5-St. SW, Calgary, Alberta, T2R 0Y6

Phone: (403) 614 - 7372; Email: videout En

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As such, Sam Amini would greatly appreciate your support by filling in your name and address below and signing and dating it.

1 marin ICHAR26 (Full name), am a landowner at 24138 MOTDAU

(address), and I have no objection to this land use

redesignation application.

\_Date: 11 July 2023 Signature:

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A Globally Green Corporation – Engineering Holistically Sustainable Communities

Suite 200 – 1201 5 St. SW, Calgary, Alberta, T2R 0Y6

Phone: (403) 614 - 7372; Email: wridout@w

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As such, Sam Amini would greatly appreciate your support by filling in your name and address below and signing and dating it.

(Full name), am a landowner at MEADOW

(address), and I have no objection to this land use

redesignation application.

Date: TMLY 11, 2023 Signature:

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A Globally Green Corporation - Engineering Holistically Sustainable Communities

Suite 200 – 1201 5 St. SW, Caigary, Alberta, T2R 0Y6 Phone: (403) 614 – 7372; Email: v ridout

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As such, Sam Amini would greatly appreciate your support by filling in your name and address below and signing and dating it.

(Full name), am a landowner at Meadow Bay 36 (address), and I have no objection to this land use

redesignation application.

Date: July 11/23 Signature:

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A Globally Green Corporation - Engineering Holistically Sustainable Communities!

Suite 200 - 1201 5 St. SW, Calgary, Alberta, T2R DY6

Phone: (403) 614 - 7372; Email: vridout @www.in

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As such, Sam Amini would greatly appreciate your support by filling in your name and address below and signing and dating it.

1, Maia Raicen (Full name), am a landowner at 24200 Meadow Dive (address), and I have no objection to this land use

redesignation application.

Signature: Bola an Date: Jul. 2023

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A Globally Green Corporation - Engineering Holistically Sustainable Communities! Suite 200 - 1201 5 St. SW, Calgary, Alberta, T2R DY6 Phone: (403) 614 - 7372; Email: v.ridout@www

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As such, Sam Amini would greatly appreciate your support by filling in your name and address below and signing and dating it.

1, <u>Shappon</u> (Full name), am a landowner at 24157 Meadow Drive (address), and I have no objection to this land use

redesignation application.

Signature: Staley 11/23

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A Globally Green Corporation - Engineering Holistically Sustainable Communities!

Suite 200 – 1201 5 St. SW, Calgary, Alberta, T2R 0Y6 Phone: (403) 614 – 7372; Email: v.ridout@w

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As such, Sam Amini would greatly appreciate your support by filling in your name and address below and signing and dating it.

1, Robert Morrow (Full name), am a landowner at 24165 meadow drive (address), and I have no objection to this land use

redesignation application.

Signature: Ribert Morne Date: July 1/23

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A Globally Green Corporation - Engineering Holistically Sustainable Communities! Suite 200-1201 5-St. SW, Calgary, Alberta, T2R 0Y6 Phone: (403) 614 - 7372; Email: v. idors

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As such, Sam Amini would greatly appreciate your support by filling in your name and address below and signing and dating it.

ADOW - DR (address), and I have no objection to this land use (full name), am a landowner at gnation application. Leald Date: july 6-2023

Signature:

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