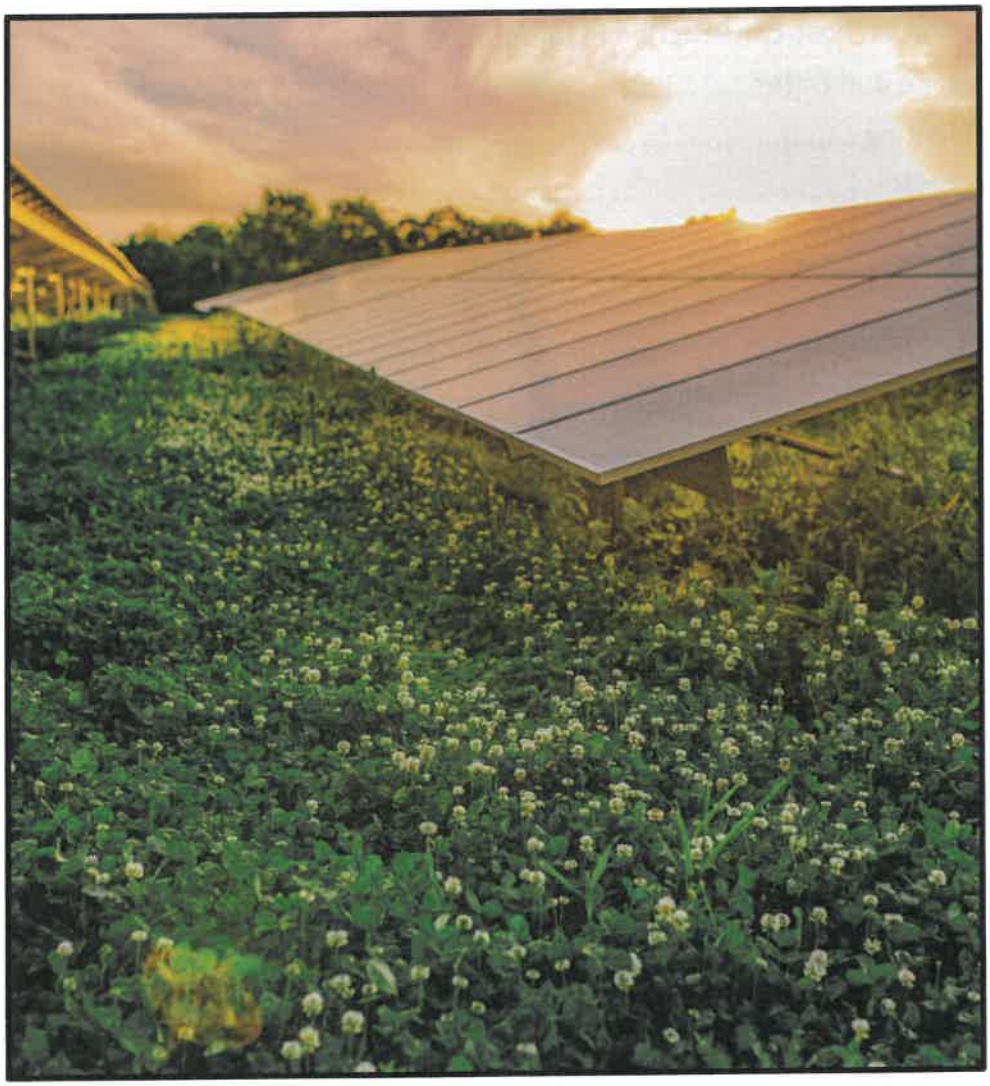
Franklintown Solar

Vegetation Management Plan



CONSERVATION BLUEPRINT

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JEFFERSON COUNTY PLANNING
ZONING & ENGINEERING

Developed by Conservation Blueprint, LLC.
for Franklintown Solar LLC

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Introduction

Franklintown Solar LLC (Franklintown) is developing a solar energy facility that is planned to cover approximately 461 acres in Jefferson County, West Virginia and generate up to 80 megawatts of energy. The solar facility is being built with a typical minimum lower panel height between the ground and the leading edge of the panel of 20". Franklintown has developed this Vegetation Management Plan (VMP) to guide the activities of site preparation, installation of prescribed seed mixtures, management and control of invasive species and noxious weeds and the overall management of the established vegetation on the site.

The primary goal of this plan is to provide detailed guidance on how to establish a final vegetative cover that works with project operations, increases the benefits of plant diversity on the site, controls erosion and runoff, controls invasive plant species on the site and works with long-term management and maintenance on the site. In addition, Franklintown is working with The Bee and Butterfly Habitat Fund (BBHF) to enroll this site into their Solar Synergy program (SolarSynergy - BEE AND BUTTERFLY HABITAT FUND (beeandbutterflyfund.org). This program is designed to incorporate pollinator heath and habitat benefits into the site's vegetation management as well as document climate change attributes like carbon sequestration changes on the site over time.

This plan addresses the proposed revegetation and vegetation management within the project boundary of Franklintown. This plan provides guidance on the existing site conditions, site preparation methods, seed mixtures, planting methods and maintenance recommendations to meet the vegetation goals over the 35-year lifespan of the Franklintown Solar facility.

This document is intended to apply adaptive management practices, implement Integrated Vegetation Management approaches, and serve as a working document. Updates and revisions will be made as new information is obtained with respect to the vegetation management, site characteristics and availability of management practices at the time of procurement of services. The successful establishment and management of vegetation that produces pollinator health and habitat benefits requires a specific plan that incorporates several fundamental steps for the site preparation, planting, seed mixture design and future management of the planting.

One of the most important aspects of the Franklintown Vegetation Management Plan and its guidance is to ensure the invasive, early successional plant species that will show up on the site are controlled quickly and not allowed to become established. There are five primary tools available for site managers to control invasive, early successional plant species. Those tools and how they are to be implemented are described in detail in this plan and are a combination of:

1. The timing and frequency of mechanical and/or herbicide weed control.
2. Establishing cover crops with an allelopathic nature.
3. The timing and planting method of final vegetative cover establishment.
4. The application of management activities to the final vegetative cover planting.
5. Site monitoring by a vegetation expert on a scheduled basis to identify vegetative needs and their proposed solutions.

Vegetation Installation Plan

1. Crop Herbicide Residual Affect Review.

For areas of the project that were cropped in the past 2 years, it is critical that the herbicide use history for that entire period be obtained and reviewed prior to the planting of the project seed mixtures. Because some herbicides likely used on the site to produce both Corn and Soybeans can remain active in the soil for as long as 18 to 24 months, the past herbicide use needs to be considered to ensure that a potential herbicide residual affect period will not negatively impact the establishment of the project seed mixtures or individual components of the seed mixture.

The vegetation installation company installing the vegetative cover on Franklintown will have soil suitability tests conducted on the site to determine if there is an herbicide residual on the site and to assess the soil's nutrient availability. Soil tests will be conducted by a qualified agronomic laboratory. All tests will be completed before seed mixtures are scheduled for planting and with enough lead time to develop alternative strategies and/or seed mixtures if an herbicide residual effect is identified.

If a past crop herbicide use on the site is listed as having a residual affect that would negatively impact the germination and growth of any of the seed mixture components, a cover crop mixture will be designed by a vegetation management specialist and established to bridge the herbicide residual affect period.

2. Site Preparation Activities

Proper site preparation is the single, most important factor that will determine both the initial establishment and the long-term success of the final vegetative cover planting. All site preparation activities will be conducted in a manner to maintain compliance with the Storm Water Pollution Prevention Plan (SWPPP).

Areas of the project that are in existing grassland vegetation and have not had that cover removed or terminated because of grading activities, agricultural crop production, tree removal or site construction will have that vegetation maintained on the site as the final vegetative cover.

The areas of the project identified for planting the Solar Array Area and Buffer Area Seed Mixtures have all had, or will have, a significant portion of the existing vegetation on the sites removed and controlled through the agricultural practices, tree removal or grading activities conducted on them. These locations will very likely have invasive, early successional plant species (weeds) start showing up on them as soon as agricultural crops and their herbicide applications are concluded, or the grading activities have removed the existing vegetation.

Some of the conditions that need to be achieved for proper site preparation include:

- A planting surface that is free of stones, soil clods, large roots, branches, construction materials or other materials that may negatively affect the planting and seedling development.
- Soils with sufficient pore space in them to permit the root development and penetration of seedlings. This is important both for the establishment of the seed mixture as well as the ability of the site to percolate moisture into and through the soil in the future.
- Soil compaction rates of 200 pounds per square inch or less.
- Adequate nutrients (N, P and K) for seed germination and seedling growth.
- Fine-grained soil materials that can maintain and hold soil moisture and nutrients.
- Site civil design and construction must achieve adequate drainage to prevent ponding or saturated soils. Stormwater management features operating as designed.
- The final seed bed should be characterized by a loose, firm, and smooth soil that will aid in seed to soil contact required for a successful final vegetative cover planting and establishment.

Step 1: Areas of the project that are growing agricultural crops in 2025 prior to Franklintown construction should be encouraged to have their final agricultural crop be planted to soybeans. Planting the areas of the site that are in agricultural production to soybeans prior to the establishment of the final vegetative cover produces several significant benefits:

- The soybean crop will naturally fix nitrogen from the atmosphere into the soil that will be a boost to the growth and establishment of the final vegetative cover planting.
- This crop will not produce the furrows or extensive crop residue that will be found in fields that were planted to corn. This can help reduce the amount of additional tillage activities needed to prepare the site for planting.
- This crop and the amount of residue associated with it would allow for the site to be broadcast seeded during the winter if that is the planting option that is selected.
- There is a significantly reduced likelihood of soybean crops producing an adverse and long-term herbicide residual effect compared to high likelihood of an adverse and long-term herbicide residual effect with corn and other agricultural crops.

Step 2: Prior to planting the final vegetative cover seed mixtures, apply two tillage activities to the locations of the project that were formerly agricultural fields. Tillage activities are applied to former crop fields to level out the crop rows (furrows), reduce crop residue that were the result of agricultural activities and/or terminate any existing weed growth that has started on the site. Crop rows and furrows will likely be common on agricultural fields that were formerly planted to corn. The first tillage application should be a vertical tillage to remove the rows in the field but should not be conducted deeper than 3". Tillage activities that are conducted deeper than 3" will disrupt the soil structure making the site slower to dry out following rain events and more susceptible to ruts and compaction during the construction process. The second tillage application should be applied with a field finisher. The preferred timeline for tillage application should be as early in the spring as field conditions will allow.

Step 3: Following the completion of tillage or grading activities, the solar array area seed mixture or the cover crop seed mixture should be planted within 48 hours. Failure to plant the seed mixture as soon as possible following the tillage or grading activities allows the soil to dry out and decreases the value of the seed bed for seed germination.

Step 4: If the planting of the final vegetative cover or the cover crop is not able to be completed within 48 hours of final tillage, the site shall be monitored for the emergence of weeds. If the timeline of activities on the project has allowed volunteer plants to develop and show up on the site, a Glyphosate herbicide application will be applied to eliminate those plants from the seed bed.

A Glyphosate application will eliminate winter annual and/or early spring plant growth that will be highly competitive to a newly established final vegetative cover. Existing vegetation will be terminated with a Glyphosate herbicide application. Glyphosate herbicide application will be applied in the following manner:

- Apply a Glyphosate herbicide application at a rate of 2 quarts/acre.
- Herbicide should be applied while air temperatures are between 60° and 85°F.
- Herbicide should be applied when relative humidity is less than 80%.
- Herbicide should be applied with no more than 10 gallons of solution (herbicide plus water) per acre and include Ammonium Sulfate (AMS) at a rate of 17 pounds/100 gallons of water.
- Herbicide should be applied on a sunny or mostly sunny time of the day.
- Herbicide should not be applied within 2 hours of sunrise or sunset.
- Apply in manner where the herbicide makes contact with the still green and growing vegetation.

All herbicide applications used on the project shall be EPA-registered at that time of application, shall be applied by a current West Virginia licensed applicator, and shall only be applied in accordance with the label recommendations, applicable law, and landowner requirements.

Herbicide applications will not be required in areas of the project where the existing vegetation is being maintained on the site like rights-of-way, ditches, former pastures where grading activities did not occur, etc. Those areas will typically not need to be established with a new seeding of the array area seed mixture or a cover crop.

Site preparation activities that include tillage, grading, de-compacting soils, and other instances of soil disturbance will ultimately stimulate the germination of weed seeds that have remained dormant in the soil bank, sometimes for decades. If the site is planted with the solar array area seed mixture or a cover crop seed mix within 48 hours of soil disturbance, the negative effects from weed seed stimulation and growth can be reduced or mitigated.

In most cases, these seeds will be represented by invasive, weedy plant species that often come with an allelopathic effect that is detrimental to the establishment of a final vegetative cover. Having a plant(s) with an allelopathic nature refers to:

> *The beneficial or harmful effects of one plant on another plant by the release of chemicals from plant parts by leaching, root exudation, volatilization, residue decomposition and other processes in both natural and agricultural systems.* (Allelopathy - Wikipedia)

Challenging plant species known to occur on the site include kochia, ragweed, bindweed, mare's tail, pigweed, and other weedy plant species. These plant species can be difficult to control and produce significant management issues for the project into the future.

In all cases, these volunteer plant species should be controlled and removed from the site as soon, as completely and as quickly as possible. The worst-case scenario would be to have these species to appear on the site, be allowed to grow and produce the following problems:

- Becoming competitive with a newly established final vegetative cover.
- Be allowed to grow to the point of producing an allelopathic effect on the planted and newly established final vegetative cover.
- Produce a viable seed creating a situation that negatively affects both the establishment of the final vegetative cover for the project and produce significant, costly management issues going forward.

If these volunteer plant species are allowed to grow and expand without early and timely management activities being applied, they may jeopardize the successful establishment of the final vegetative cover.

3. Pre-construction vs. Post-construction Planting Strategies

Option 1: Pre-Construction Final Vegetative Cover Establishment

Establishment of a final vegetative cover in a pre-construction fashion is preferred and will be determined based on how much of the site will be graded and how much of the site will need to be replanted based on construction activities. Establishing the final cover pre-construction offers several key advantages that include:

- Not needing to establish and subsequently manage and/or terminate a cover crop.
- Being able to complete all the necessary site preparation activities more effectively.
- Being able to plant the entire site with a no-till grass drill that will increase the seed germination rate and shorten the timeline needed to achieve fully established vegetation. This technique will produce the best results for a well-established final vegetative cover.
- Eliminating the outcome where the final vegetative cover is established differently under the solar panels vs. in the alley rows.

- Establishing the final cover in a manner that will allow for more effective and complete weed control and management.

In general, pre-construction establishment of the cover is a cost-effective option when 30% or less of the site will be graded or have the final vegetative cover destroyed through construction activities.

Option 2: Post-Construction Final Vegetative Cover Establishment

If the decision is made to establish the final vegetative cover during or following construction, the site will be prepared following the Site Preparation Activities listed in this VMP and then established to a cover crop as early in the growing season as possible. The cover crop will provide soil stabilization and weed suppression throughout the construction period until a timeline and condition has been reached to plant the final vegetative cover. A cover crop on the site will be established using one of the cover crop options listed in Appendix E. The final vegetative cover will be established following construction on the site following the planting timelines and techniques listed (Appendix C).

Soil compaction greater than 200 pounds per square inch produces a negative planting environment by compressing soil particles together and reducing the pore space between those particles. Compacted soil does not have the pore spaces for newly germinated seeds to allow for root expansion and growth as well a reduced rate in water infiltration and drainage. Any soil compaction rates that exceed 200 pounds per square inch will negatively affect seed germination, plant growth and overall seeding establishment success and will require soil decompaction activities.

Prior to planting a seed mixture, the entity installing the final vegetative cover should test the level of soil compaction on the site. Any areas where the soil has been compacted by construction or agricultural activities that exceed 200 pounds per square inch will need to be de-compacted prior to replacing the topsoil and/or preparing the site for planting. For shallow decompaction, a disk may be used with a minimum of two passes. For deeper, more significant compaction, a winged subsoiler or straight ripper shank should be used followed by a disk with a minimum of two passes. Following soil decompaction efforts, the vegetation contractor will review the site to determine if additional soil decompaction efforts are necessary.

4. Planting Timeline and Dates

The available planting window for seed mixtures is determined by two primary factors: soil temperature and the available moisture both at the time of planting and for the next 80 days. In all cases, the final vegetative cover planting should begin within 48 hours following grading and other site preparation activities. Planting activities that occur more than 48 hours following soil disturbance activities increase the opportunity for significant weed competition on the site and/or drying out of soil moisture.

Solar Array Seed Mix: The approved seed mixture (Appendix A) can be planted following these timelines:

- Average Freeze Dates for Jefferson County, West Virginia: Please note these important dates that have been used for determining planting window availability (Interactive map: average date of last spring freeze across the United States | NOAA Climate.gov and Frost and Freeze Information (weather.gov):
  1. Average last freeze date in the spring is April 20th.
  2. Average first freeze date in the fall is November 1st.

- Any plantings that occur during the listed time periods using an air seeder, broadcast seeding or hydroseeder will require a minimum of 70 days and up to 140 days to germinate and develop seedling growth and secondary roots mature enough to survive the rigors of heat, drought and/or freezing (Appendix C).

  This is a longer period than would be observed if the same seed mixture were planted with a grass drill (a minimum of 55 days and up to 85 days) as the seed to soil contact conditions and access to moisture are highly variable. During this period, the seed germination and seedling growth is highly susceptible to impacts and delays from heat, lack of moisture and/or termination due to freezing.

- Planting may be completed using an air seeder, hydroseeder or no-till grass drill in the winter and spring between the time in the fall when the soil temperatures reach 50° F or less and May 31st. The goal of a spring planting should be to complete the planting as early in this timeline as possible. The seed mixture will be planted following the site preparation and cover crop options outlined in the Site Preparation and planting for seed mixture section of the Vegetation Management Plan.

- Planting may be completed using a broadcast seeding operation in the winter and spring between the time in the fall when the soil temperatures reach 50° F or less and April 30th. The seed mixture will be planted following the site preparation and cover crop options outlined in the Site Preparation and planting for seed mixture section of the VMP.

- Planting may be completed using an air seeder or hydroseeder in the late summer/early fall between the dates of August 1st and August 23rd. The goal of a fall planting should be to complete the planting as early in this timeline as possible. The seed mixture will be planted following the site preparation options outlined in the Site Preparation and cover crop section of the VMP.

- Planting may be completed using a no-till grass drill in the late summer/early fall between the dates of August 1st and September 7th. The goal of a fall planting should be to complete the planting as early in this timeline as possible. The seed mixture will be planted following the site preparation options outlined in the Site Preparation and cover crop section of the VMP.

  Planting outside of the listed planting window dates may make the newly establishing plants become highly susceptible to termination due to freezing. With an average first freeze date of November 1st, the latest date an air seeder or hydroseeder planting should be used during the growing season is August 23rd (70 days before the average first freeze) and the latest date a drill seeding should be used during the growing season is September 7th (55 Days to average first freeze) (Appendix C).

Array Area Seed Mix: Available Planting Dates by Planting Method

Planting Method	Spring		Late Summer		Winter - Dormant Seeding	
	Start Date	End Date	Start Date	End Date	Start Date	End Date
No-till Drill	February 15th	May 31st	August 1st	September 7th	Soil Temp @ 50° F or less	Until the Soil is Frozen
Hydro-seeder	February 15th	May 31st	August 1st	August 23rd	Soil Temp @ 50° F or less	February 15th
Air-seeder	February 15th	May 31st	August 1st	August 23rd	Soil Temp @ 50° F or less	February 15th
Broadcast seeding	February 1st	April 30th	N/A	N/A	Soil Temp @ 50° F or less	February 1st

Buffer Array Seed Mix: The approved seed mixture (Appendix B) can be planted following these timelines:

- Average Freeze Dates for Jefferson County, West Virginia: Please note these important dates that have been used for determining planting window availability (Interactive map: average date of last spring freeze across the United States | NOAA Climate.gov and Frost and Freeze Information (weather.gov):
  1. Average last freeze date in the spring is April 20th.
  2. Average first freeze date in the fall is November 1st.

- Any plantings that occur during the listed time periods using an air seeder, broadcast seeding or hydroseeder will require a minimum of 70 days and up to 140 days to germinate and develop seedling growth and secondary roots mature enough to survive the rigors of heat, drought and/or freezing (Appendix C).

  This is a longer period than would be observed if the same seed mixture were planted with a drill (a minimum of 55 days and up to 85 days) as the seed to soil contact conditions and access to moisture are highly variable. During this period, the seed germination and seedling growth is highly susceptible to impacts and delays from heat, lack of moisture and/or termination due to freezing.

- Planting may be completed using an air seeder, hydroseeder or no-till grass drill in the winter and spring between the time the soil temperatures reach 50° F or less and May 31st. The goal of a spring planting should be to complete the planting as early in this timeline as possible. The seed mixture will be planted following the site preparation and cover crop options outlined in the Site Preparation and planting for seed mixture section of the Vegetation Management Plan.

- Planting may be completed using a broadcast seeding operation in the winter and spring between the time the soil temperatures reach 50° F or less and April 30th. The seed mixture will be planted following the site preparation and cover crop options outlined in the Site Preparation and planting for seed mixture section of the VMP.

Buffer Area Seed Mix: Available Planting Dates by Planting Method

Planting Method	Spring		Late Summer		Winter - Dormant Seeding	
	Start Date	End Date	Start Date	End Date	Start Date	End Date
No-till Drill	February 15th	May 31st	N/A	N/A	Soil Temp @ 50° F or less	Until the Soil is Frozen
Hydro-seeder	February 15th	May 31st	N/A	N/A	Soil Temp @ 50° F or less	February 15th
Air-seeder	February 15th	May 31st	N/A	N/A	Soil Temp @ 50° F or less	February 15th
Broadcast seeding	February 1st	April 30th	N/A	N/A	Soil Temp @ 50° F or less	February 1st

5. Cover Crop Planting

For areas of the project being planted to the Solar Array Area and Buffer Area Seed Mixtures that were: 1) Formerly in agricultural crops, 2) Where the existing vegetation has been terminated, removed, or altered during construction or 3) Site preparation activities disturbed existing vegetation will be required to establish a cover crop if there is a timeline to bridge between when:

A) The vegetation has been removed and/or terminated and the start of an available listed planting timeline window for the final vegetative cover.

B) The start of the growing season and the establishment of the final vegetative cover following construction.

Cover crops will be seeded on these areas to comply with the project SWPPP using one of the cover crop options listed (Appendix E). Cover crops will be established using a broadcast seeding, air seeding, hydroseeding or no-till drill method. The preferred establishment technique will be to plant the cover crop using a no-till drill.

The primary role of a cover crop is to suppress weed competition and growth. For this reason, it is critically important that a cover crop seed mixture be used that has significant allelopathic attributes. Having a plant(s) with an allelopathic nature refers to:

The beneficial or harmful effects of one plant on another plant by the release of chemicals from plant parts by leaching, root exudation, volatilization, residue decomposition and other processes in both natural and agricultural systems. (Allelopathy - Wikipedia)

In this case, the cover crop selected should have the ability to produce an allelopathic effect and help to diminish the germination and growth of weed species seeds that are on the site. While many often view a cover crops role as soil stabilization and erosion control, the most important role for a cover crop on this project is weed growth suppression.

6. Planting Methods

All plant materials must be installed as outlined, at the correct time and as described in this Vegetation Management Plan. Any exceptions or changes to the installation must be approved by Franklintown and the contractor shall receive authorization in writing for any changes or deviations prior to the start of work.

The vegetation contractor will review the site and determine which planting method will produce the best final vegetative cover outcome. Depending on the seed mixture being planted and the listed available timelines for planting, seed mixtures may be planted using an air seeder, hydroseeder, no-till grass drill and/or by broadcast seeding. Seed mixtures that are being planted into a cover crop or other existing vegetation must be planted using a no-till grass drill unless that existing vegetation has been terminated and had the thatch removed to allow for sufficient seed to soil contact.

Air Seeder or Hydroseeder: For plantings that are established using an air seeder or hydroseeder, it is critically important that the site is prepared to provide a high ratio of seed to soil contact. If the seed being sown is blocked by existing or residual vegetation and does not contact the soil, it will not germinate and grow.

Additional considerations:

- The seed mixture and any inert material must all be thoroughly mixed at the time of planting.
- A cultipacker must be used on the site following seeding to ensure the area has a firm seed bed and increased seed to soil contact to produce greater seed germination rates.
- Because this is a more specialized version of broadcast seeding a seed mixture and not placing the seed into the ground as would be accomplished with a drill, seeding rates using this method must be increased by 30% from the rates listed with the seed mixture in Appendix A and B. Increased seeding rates are being required to account for seed loss due to environmental conditions and/or animal damage.

No-till Grass Drill: Establishing the final vegetative cover using a no-till grass drill is the most preferred planting method. For plantings that are established using a no-till grass drill, it is critically important to ensure that seeds are not planted too deep. The ideal planting depth for any seed is 2x the diameter of the seed. For the seed mixtures designed for the Franklintown project, the appropriate planting depth for the seed mixture is 1/8" to 1/4" and not any deeper.

A no-till grass drill is a piece of equipment that is designed to insert and/or place the seed into the soil and then cover the seed with a press wheel or a cultipacker. Using a piece of equipment described as an agricultural "seeder" does not constitute the use of a 'no-till grass drill' for the purposes of this vegetation management plan. The use of a "seeder" will be considered a broadcast seeding application that is followed with a cultipacker and would require a 30% increase in the seed mixture planting rate.

- For an example of a No-till Grass Drill, please view: FLEXII Series Grass Drill - TRUAX Company, Inc.
- For an example of an agricultural seeder, please view: Agricultural Seeders - Landoll

Broadcast Seeding: A broadcast seeding is the least preferred planting method of all the planting options listed in this VMP. This planting method is the most susceptible to weather fluctuations and limitations, will take the longest time to germinate and establish, requires a 30% increased seeding rate, and offers the most restricted set of planting window timeline options.

For plantings using a broadcast seeding method, it is critically important that the site be prepared to provide a high ratio of Seed to Soil contact. If the seed being broadcast does not contact the soil, it will not germinate and grow.

Additional considerations for broadcast seeding:

- On sites where significant soil disturbance has occurred prior to, or during, the planting process, a cultipacker must be used on the site following broadcast seeding to help ensure the area has a firm seed bed and increased seed to soil contact and seed germination rates.
- The seed mixture and any inert material must all be thoroughly mixed at the time of planting.
- Seed mixture seeding rates must be increased when broadcast seeding methods (ex: Hydro seeding, Air seeder, broadcaster, agricultural seeder, etc.) are being used to account for seed loss due to environmental conditions and/or animal damage. Broadcast seeding rates must be increased by 30%.
- Under optimal temperature and moisture conditions, the general timeline to establishment of the solar array area seed mixture based on planting technique applied:

Final Vegetative Cover Considerations	No-till Drill	Broadcast Seeding
Seed Germination Timeline	15 to 25 days	30 to 70 days
Minimum Timeline Needed for Seedling Growth & Maturity	40 to 60 days	40 to 70 days
Total Time Needed to Reach Minimal Establishment	**55 to 85 days**	**70 to 140 days**

7. Solar Array Area Seed Mixtures

Seed mixtures were designed to meet some very specific Franklintown and BBHF project objectives (Appendix G). These species have been reviewed and are commercially available at the time of the vegetation management plan development. The final seed mixture design and bid to be used on Franklintown will be provided following these seed mixture design components:

- Following the Solar Synergy program agreement between Franklintown and the BBHF, the solar array seed mixture will be sourced and obtained through the BBHF.
- Seed mixtures will exclude the use of Tier 1 and Tier 2 species from the list of Invasive Plant Species of West Virginia (Appendix F).
- The species included in the seed mixture shall be true to the scientific name as specified in the mixture listed in Appendix A and B. Seed mixture components will be listed by both common name and scientific name in the bidding and procurement process.
- All seed lots obtained for planting on the Franklintown project must be originally sourced from production fields within the United States of America (USA). No seed sources may be obtained that were sourced from outside of the USA.

- The seed mixture was designed and will be provided for Franklintown based on Pure Live Seed (PLS) Pounds/acre seeding rates and their corresponding seeds/ft^2 seeding rates (Appendix A).
- Seed mixtures designed and/or provided based on bulk pounds/acre will not be accepted.
- Seed lots used on the site must have a current test date that is less than 6 months old and document both the purity and germination rates of each and every individual component in the seed mixture. A single seed test that has been applied to the seed mixture will not be accepted.
- The seed tag generated for all seed mixtures procured for use on the site will contain the following information for each component of the seed mixture: Species Name, Lot Number, Purity, Germination Rate, Bulk pounds, PLS pounds, Percent of overall mixture, Test Date, Weed Seeds, Planting Rate per Acre, and Origin of the Seed (Appendix D).
- Seed mixture components must comply with the seed laws of the state the seed is being established in.
- No alterations have been made to the final seed mixture design. Any substitutions or changes to the seed mixtures must be approved by Franklintown in writing prior to approval and/or installation.
- The accepted seed mixture design being bid on and acquired will be reviewed and approved by a vegetation management specialist to ensure the listed seed mixture design requirements are correctly being met and have not been adjusted.

The Solar Array seed mixture was designed to include clover (*Trifolium* sp.) species to be able to withstand future mowing activities, provide significant regrowth opportunities, deliver soil health benefits, and produce significant pollinator health and habitat benefits (Appendix K). These species are regularly used in agricultural practices that include haying activities that remove the vegetation throughout the growing season.

An additional key consideration to the inclusion of clover or other native legume species in the array area seed mixture is their ability to naturally fix nitrogen. Several of the grass and forb species components of the array area seed mixture require a significant amount of nitrogen to be maintained successfully on the site each year. The inclusion of clover and other legume species in the seed mixture is a critical component that will produce significant long-term benefits to the grass establishment, growth, and longevity on the site.

In addition to the areas of the site inside the project fence that are currently identified for establishing a Solar Array Area seed mixture, there may be additional locations outside the project fence that will be established to a vegetative cover. In the event the projects' final location and design creates small or oddly shaped fields outside the fence, Franklintown may work with the adjoining landowners to establish a final vegetative cover seed mixture in locations they prefer to have returned or established to this vegetative cover.

8. Buffer Area Seed Mixtures

A Buffer Area seed mixture has been developed to enhance and expand the pollinator health and habitat benefits associated with the Franklintown project in cooperation with the BBHF and the Solar Synergy program. Prior to planting the Buffer Area Seed Mix, any established cover crop will be terminated with either a Glyphosate herbicide or mowing application. The application of Glyphosate herbicide will be applied following the guidelines listed on page 6 of this VMP.

The final seed mixture design will be provided following these seed mixture design components:

- Following the Solar Synergy program agreement between Franklintown and the BBHF, the buffer area seed mixture will be provided at no cost or at a discounted rate through the BBHF.
- The seed mixture will exclude the use of Tier 1 and Tier 2 species from the list of Invasive Plant Species of West Virginia (Appendix F).
- The species included in the seed mixture shall be true to the scientific name as specified in the mixture listed in Appendix B. Seed mixture components will be listed by both common name and scientific name in the bidding and procurement process.
- All seed lots obtained for planting on the Franklintown project must be originally sourced from production fields within the United States of America (USA). No seed sources may be obtained that were sourced from outside of the USA.
- The seed mixture was designed and will be provided for Franklintown based on Pure Live Seed (PLS) Pounds/acre seeding rates and their corresponding seeds/ft^2 seeding rates (Appendix B). Seed mixtures designed and/or provided based on bulk pounds/acre will not be accepted.
- Seed mixture components must comply with the seed laws of the state the seed is being established in.
- No alterations have been made to the final seed mixture design. Any substitutions or changes to the seed mixtures must be approved by Franklintown in writing prior to approval and/or installation.
- The accepted seed mixture design being bid and acquired will be reviewed and approved by a vegetation management specialist to ensure the listed seed mixture design requirements are correctly being met and have not been adjusted.

Within 7 to 10 days of the termination of the cover crop, the Buffer Area Seed Mix will be planted using one of the approved planting methods and within an approved planting timeline (Appendix C). The contractor installing the seed mixture will select a time during the available window based on construction activities.

9. Seed Storage Considerations

Once the solar array and/or buffer area seed mixtures has been delivered to the Franklintown site and are being stored pending planting, it is critically important that the seed be maintained and held in a manner that protects the seed germination rates and viability. Grass and forb seeds are easily degraded by environmental conditions, sometimes within a very short period. The primary environmental influences that can quickly degrade the germination rate of a seed lot are air temperature and relative humidity (Principles and practices of seed storage : Justice, Oren L : Free Download, Borrow, and Streaming : Internet Archive).

While seed lots are being maintained on site, their storage should be conducted based on "*The Rule of 100*". The Rule of 100 is a guide that monitors and notes the conditions when seed germination is susceptible to being degraded. In this rule, when the values for the air temperature (^{o}F) are added to the Relative Humidity (% Relative Humidity) are added together and they exceed the value of 100, seed germination is negatively affected. As an example, if seed were stored in a location with a daily ambient air temperature that reaches 80 ^{o}F and a Relative Humidity that reaches 50%, those environmental factors would produce a score of 130 and be in a condition where seed degradation is likely to occur. Increased rates of Relative Humidity have the greatest negative impact on seed viability and can be of significant concern if seed lots are held on site through the summer period. The higher the Rule of 100 score, the faster the seed degradation will occur.

Seed viability on the site should be maintained by following these key factors:

- Make sure to obtain the original seed lots from a seed vendor that has stored their seed lots in a climate-controlled environment.
- Arrange to have seed lots delivered to Franklintown solar in allotments and as close to the actual planting date and schedule as possible. Seed orders should be able to be placed and delivered in allotments that reduce the need to store large amounts of seed on the site. An example would be to have allotments of 200 acres worth of seed mixtures delivered to the site on a weekly basis during the planting time period.
- Make sure to obtain original seed lots that have a current test date that is less than 6 months old and are documenting both the purity and germination rates of each and every individual component in the seed mixture (Appendix D). A single seed test that has been applied to the seed mixture will not be accepted.
- Purchase seed lots that are younger (more current) and not part of a seed lot that has been stored for multiple years. Seed lots that are multiple years old may have a current test showing acceptable germination rates but are more susceptible to germination degradation.
- If seed lots need to be maintained on site for an extended period, they need to be stored in a climate-controlled environment.

10. Vegetation Contractor Qualifications

Contractors that are responsible for the implementation and delivery of the vegetation management plan will be knowledgeable of the tasks, procedures and practices that are outlined in the VMP (see page 27 for additional detailed qualification requirements). The contractor will use equipment to deliver the VMP that is of the appropriate size and function to work within the array area of the project. The individual plant species used to design the Franklintown seed mixtures all have a high likelihood of successful establishment when the guidance and requirements of this VMP are followed.

Vegetation Management Plan

A vegetation management specialist will determine the management options and implementation plans as the Franklintown project moves forward in the future. These plans will be implemented to ensure that a final vegetative cover is in place for the life of the project, is providing pollinator health and habitat benefits and is being managed to ensure the vegetation is compatible with the objectives of safe and reliable power generation.

All vegetative cover established on the Franklintown site will require regular, planned management activities. The following guidelines are intended to provide a plan during the establishment phase of the final vegetative cover. A vegetation management specialist will be used to provide guidance in the future that is based on what is occurring on the site during each growing season. That guidance will be designed and applied based on how the vegetative cover is moving through natural successional changes, weather conditions, weed competition, response to grazing activities and site conditions.

- **Establishment Management: Year 1**

  The management activities in Year 1 should be focused on controlling the competitive, invasive and/or noxious weed components of a newly established planting. When management activities and their timelines are strictly adhered to in Year 1, it can both increase the pace at which the final vegetative cover becomes fully established and significantly decrease the amount and intensity of Operation & Maintenance activities that need to occur in the future on the site.

  Mowing: Mowing activities that follow the planting of the final vegetative cover in the first growing season are extremely critical. The timing, frequency and height of those mowing activities often determine the success or failure of a planting and/or the length of time required for the planting to be determined a success.

  Conduct all mowing activities to ensure that the volunteer plant species that show up on the project location in the first growing season are not allowed to mature, flower and/or produce viable seeds. If weed control management efforts fail to be conducted or are late in being applied, the success of the final vegetative cover establishment will be in danger of failing and require re-planting activities.

Photographic examples of the Solar Array Area seed mixture establishment have been included in this VMP to provide additional management guidance and examples. Images are provided at the 2-month post planting stage (Appendix H) and the 4-month post planting stage (Appendix I). In the 2-month post planting example, the designed solar array seed mixture is beginning to germinate and grow, but it is also showing the competition that is also starting from volunteer weed species on the site. This photographic example demonstrates the moment in time when mowing activities need to begin to be applied to the new planting to control the volunteer weed species while they are young and vulnerable to the listed management activities.

When mowing activities are applied in an early, timely and regular manner, the final vegetative cover can begin to outcompete the volunteer weed species (Appendix I) and transition to a fully established vegetative cover in year 2 (Appendix J). When planted in the spring, it is likely the established vegetative cover will require 3 mowing events to control volunteer weed growth and establishment during the first growing season. Failure to apply early, timely and regular management to plantings in the first growing season leads to situations where the volunteer weeds become more and more challenging to control. Mow early and mow often in the first growing season.

Mowing activities during the first growing season should be conducted at a height of 4" to 6" above the ground. Mowing activities that are conducted at a lower height may damage the final vegetative cover as it is working to become established. When mowing activities are applied at the correct time, frequency and height, another advantage is that those mowing activities do not create a mulch that can serve to smother and inhibit the final vegetative cover as it is working to become established.

If vegetation has been allowed to reach a height of >20 inches prior to mowing, then mowing activities will be conducted with a flail-type mower to reduce the amount of mulch that will be deposited on young seedlings and fragile plant growth.

Mowing activities should not be conducted when soil is saturated to prevent soil compaction on the site. Management activities that create soil compaction can result in seed establishment failure, the establishment of invasive or noxious weeds, rutting on the site and/or creating water infiltration issues that lead to ponding on the site.

- **Establishment Management: Years 2 to 3**

  Mowing: The timing and frequency of mowing during the 2nd and 3rd years of establishment should be evaluated and recommended by a vegetation management specialist familiar with the establishment and management of pollinator habitat.

  Mowing activities should be conducted in the following manner:

  - Use of a flail-type mower to prevent the build-up of a thatch that could negatively affect the establishment and growth of the installed seed mixture.
  - Conduct all mowing activities with a mowing height of 8 to 12 inches tall.

- Conduct mowing activities prior to the vegetation getting tall enough (>20 inches) that a mowing activity would create a vegetative mulch that can smoother the included plant seedlings that are being established.
- In year 2, a total of 1-2 mowing, if necessary, will be conducted. In years 3 and beyond, mowing activities will be conducted when management of the Solar Array or Buffer Area seed mixtures requires it to control weed growth and density on the site. In general, this will likely range from 0-2 mowing activities per year.
- The vegetation contractor should consider spot mowing to treat just those areas that are exhibiting aggressive, invasive, or noxious weed competition on the site.
- Conduct mowing activities to ensure that volunteer plant species that show up on the project location in the first few years of establishment (years 2-3) are not allowed to mature, flower and/or produce viable seeds.
- The pollinator value of seed mixture plantings can be maximized by conducting mowing activities at the proper height, proper timeline and later in the growing season. This will allow plants to produce the nectar and pollen resources that pollinators feed on as well as help redistribute ripened seed throughout the pollinator planting.

Mowing activities that are performed throughout the life of the project should be conducted in a manner to consider and protect ground nesting bird activities during the primary nesting season. For mowing activities completed between May 1st and August 31st, staff conducting mowing activities at the site should be trained to identify and protect avian ground nests.

During the early, initial years of the final vegetative cover establishment, mowing a site during the growing season can aid in the establishment of the cover if competition is present from undesirable and/or volunteer plant species. Mowing activity and frequency are determined based on the abundance and growth height of undesirable and/or volunteer plant species that show up in the planting. A review of the site should be conducted by a vegetation management specialist prior to mowing. A pollinator habitat tip video that outlines and demonstrates this technique can be viewed at: https://youtu.be/ind8BaWzotc

Mowing Schedule for Site Management

Year	June	July	August
Growing Season 1	Mow at 4" to 6" tall	Mow at 4" to 6" tall	Mow at 4" to 6" tall
Growing Season 2	Mow at 8" to 12" tall	Mow at 8" to 12" tall	No Mow
Growing Season 3	Mowing based on Vegetation Specialist review	Mowing based on Vegetation Specialist review	Mowing based on Vegetation Specialist review

Herbicide Use:

If undesirable or invasive plant species show up during the year of establishment, it is important to address their control and removal as soon as possible. It is critically important that undesirable or invasive species are not allowed to mature enough to produce viable seeds. Depending on the plant species to be addressed, a plan of control is best accomplished through a combination of spot mowing, spot use of herbicides or both.

If the undesirable or invasive plant species are forb-based plants (broad leaved plants), the use of a non-selective herbicides like Glyphosate or broad-leaf herbicides (e.g., 2,4-D, Garlon, etc.) can be used on an individual plants or on a spot treatment basis. Care should be taken to limit the herbicide application to the specific plant species trying to be eliminated as the herbicide will also eliminate components of the final vegetative cover plant species and other actively growing vegetation it is applied to.

For the management and control of undesirable, volunteer grasses like Crabgrass (*Digitaria* spp.) or Foxtail (*Alopecurus* spp.) species, a specific herbicide application can be applied. The recommended herbicide application would be to use Frequency® in either a pre-emergent or post-emergent application that follows the label. Several key considerations about the use of herbicide include:

- Can be used in either a pre-emergent or post-emergent fashion, but pre-emergent is probably the most effective.
- If the clovers species in the planting are taller than 3", the herbicide application should stunt the white Dutch clover, but not eliminate it.
- If used as a post-emergent application, the herbicide requires the use of an adjuvant with it for effective control.
- Most of the grasses in the Franklintown Array Area seed mixture are listed as being tolerant to the herbicide.
- There is a limit of 4 ounces/acre/treatment. Total of 16 ounces/acre/year

For spot treatment of invasive grasses, Clethodim and/or a non-selective herbicide like Glyphosate can be used. Non-selective herbicides will terminate both grasses and broad-leaved plants that are actively growing and should be applied very carefully.

All herbicide applications used on the project shall be EPA-registered at that time of application, shall be applied by a current West Virginia licensed applicator and shall only be applied in accordance with the label recommendations, applicable law and landowner requirements.

Replanting of Non-established Areas: In the event that a portion of the project has experienced poor or non-establishment, the first step will be to determine the reason for the poor or non-establishment of the final vegetative cover. Reasons for poor or non-establishment and their remediation can include:

- If the reason for poor or non-establishment is related to either site preparation or existing vegetation competition, those issues will be addressed and controlled. The area will be replanted following the planting instructions listed in this VMP.
- If the reason is related to soil conditions or soil compaction, the area will be remediated to ensure a successful planting and replanted following the planting instructions listed.
- If the reason is related to weather, the area will be replanted when the appropriate weather conditions are obtained following the planting instructions listed. Care should be taken to replant as early in the available planting timeline as possible.
- If the reason for poor establishment is related to seed lots being stored on the site outside of the 'Rule of 100' environmental conditions and the seed germination rate was degraded, replacement seed lots will need to be acquired and replanted. See 'Rule of 100' description on page 17.
- If the reason for poor establishment was planting the seed mixture outside of the listed planting window options (Appendix C), replacement seed lots will need to be acquired and established using the correct methods during the correct available dates.
- In all cases, original planting and/or replanting should be conducted in the earliest possible portion of the available timeline listed for planting dates. Because most replanting activities will likely be conducted using broadcast seedings, please review and consider the significant limitations associated with broadcast seeding listed in this VMP, especially the number of days needed to reach a minimally established stand and the requirement for an increased planting rate (Appendix C).

Areas described as non-established include locations that are bare soil. These locations are important to be reviewed and addressed by the vegetation contractor as soon as possible as they are susceptible to erosion and the introduction of aggressive, invasive and/or noxious weeds. Franklintown may coordinate with a vegetation management specialist to determine the best course of action to identify and apply appropriate remediation activities.

Maintenance and Management

The control or elimination of undesired or invasive plant species should be addressed with a combination of management tools that could include mowing and/or herbicide use and apply Integrated Vegetation Management (IVM) approaches. Other management tools like prescribed fire, grazing with cattle and disking that are often used on habitat or conservation projects will not be available or recommended for use on this site.

Where high quality pollinator resources and pollinator benefits are a project objective, there really are no projects or options where you can plant the pollinator seed mixture, walk away without a specific future management plan and have pollinator benefits continue into the future. Natural succession will move the plant community through a cycle where it eventually becomes dominated by grasses and the pollinator forb species component drops out with time. To maintain pollinator benefits, a specific management plan should be developed by a vegetation management specialist to guide the specific future management activities on the areas supporting pollinator health and habitat. Future management options include:

Mowing: Mowing vegetation growing under solar panels may be necessary to maintain safe and reliable power generation. Mowing can also be a pollinator-friendly management technique that can help maintain the diversity and vigor of a pollinator planting when the timing, height and frequency of the mowing are considered, controlled, and follow a specific plan. An example of the effective use of mowing in a pollinator planting can be viewed at: https://youtu.be/ind8BaWzotc

If pollinator health and habitat benefits are a priority for the project, the timing and frequency of mowing as a management and site maintenance activity should be evaluated and recommended by a vegetation management specialist familiar with the establishment and management of pollinator habitat. In addition, the timing of mowing activities to consider monarch butterfly needs is an example of one important consideration.

Naturalized Forb Species: The Solar Array seed mixture was designed and planted using clover (*Trifolium* sp.) species to be able to withstand future mowing activities along with a significant list of other project objectives and needs (Appendix K). These species are regularly used in agricultural practices that include haying activities that remove the vegetation throughout the growing season. An additional key consideration to the inclusion of clover in the array area seed mixture is its ability to fix nitrogen from the atmosphere and store it in the soil. Several of the grass species components of the array area seed mixture require a significant and annual amount of nitrogen to be maintained successfully on the site.

Mowing Height: All mowing activities related to establishment and future management should be completed with a mowing height of 8 to 12 inches above ground. This will allow the biannual and perennial plant species to continue developing and continue in the pollinator planting.

Herbicide Use: If grass competition in the project advances to the point where the grasses are outcompeting the forbs, herbicide application should be considered. The application of a grass-selected herbicide containing Clethodim 2E (e.g.: Arrow ® or Select ®) can be applied following label instructions to decrease grass competition. This will allow the pollinator plant species the opportunity maintain or regain the abundance they had in the planting during the early years of establishment. A pollinator habitat tip video that outlines and demonstrates this technique can be viewed at: https://youtu.be/0CiZT3P4Wb4

All herbicide applications used on the project shall be EPA-registered at that time of application, shall be applied by a current West Virginia licensed applicator, and shall only be applied in accordance with the label recommendations, applicable law and landowner requirements.

Spot Spraying and Spot Mowing: When undesirable or invasive plant species begin to occur on a project, it is important to address their control and removal as soon as possible. Depending on the plant species to be addressed, a plan of control is best accomplished through a combination of spot mowing, spot use herbicides or both. In all cases, volunteer and undesirable plants are always easier to control or eliminate when they are addressed with an herbicide and/or mowing application when they first appear on the site and are young, short, newly growing plants. Waiting until a plant matures to apply the control mechanism will decrease the effectiveness of either the herbicide application or mowing activity.

If the plant species are grass-based plants, the use of grass-selected herbicide can generally be used on a broader range without negatively impacting the pollinator plant species. If the undesirable or invasive plant species are forb-based plants, the use of a non-selective herbicide like Glyphosate can be used on an individual plant or spot treatment basis. Care should be taken to limit the herbicide application to the specific plant species trying to be eliminated as the herbicide will also eliminate the pollinator plant species.

Vegetation Quality Targets

1. Overall Target

The seed mixture listed, and the vegetation management guidelines provided in this VMP are designed to result in an established, stable vegetative cover that is compatible with safe and reliable electricity production, is beneficial to pollinator health and resources and works to deliver significant soil health benefits. When the site preparation guidelines are followed and the seed mixtures are properly planted, the site should become stable, well established, and able to be discharged. The permits and regulations for this project may impose additional requirements on the final performance and establishment of the vegetative plantings.

2. Established Seed Mixture Targets

By the conclusion of the first full growing season, at least 80% of the site shall be vegetated. To discharge the SWPPP permit for the project, at least 70% of the site must be covered with uniform perennial vegetation. By the conclusion of the third full growing season, at least 95% of the site shall be vegetated and at least 90% of the site must be covered with a uniform perennial vegetation. The seed mixtures designed for this project and the management plan, and activities listed are designed to ensure the proper site preparation activities have been performed to increase the seeding, germination and growth of the plants selected for inclusion in the seed mixtures.

3. Undesirable, Invasive and/or Noxious Weed Targets

All solar power sites will experience undesirable, invasive and/or noxious weed species that appear on their site. These species will show up on the site because of the seeds that are found on site and have remained dormant in the seed bank, often for decades. This is especially true of sites that were formerly in agricultural crop production. Once the herbicide regime being applied to agricultural crop production fields is removed, those species tend to show up early in the growing season and grow aggressively. In addition, they tend to be prolific seed producers and are often allelopathic (see detailed definition Appendix E).

All of the noxious and/or invasive plants that are prohibited in the state (Appendix F) shall be treated with an herbicide application and/or mowed at a frequency that is sufficient to prevent the plant from producing seeds and remove the plant from the project location over time. A focus will be placed on identification and control of any Tier 1 and Tier 2 species that are identified on the site.

It will be important that any noxious and/or invasive plants that occur on the site are identified and controlled as quickly as possible. A vegetation management specialist should be consulted to help determine control methods and options. If Undesirable, Invasive or Noxious weed species develop on the site, they will likely occur during the first two years following the initial planting. This will be the most critical timeframe during which frequent site reviews should be conducted by individuals able to identify individual undesirable, invasive and noxious plant species. The site should be monitored by a vegetation management specialist for both the

establishment of the seed mixtures and the presence of plants that need to be controlled and removed from the site.

4. Monitoring of the site

Site evaluations should be completed by a qualified and approved vegetation management specialist. Site evaluations should be completed every 6 to 8 weeks during the growing season in year 1 and year 2 of planting establishment. Once the array area seed mixtures are fully established, the site monitoring can be conducted one time per year during the growing season to evaluate the site for undesirable, invasive and/or noxious weed presence, future management recommendations and identification of sites in need of replanting.

This document is intended to apply adaptive management practices and serve as a working document. Updates and revisions will be made as new information is obtained with respect to the vegetation management, site characteristics and availability of management practices at the time of procurement of services.

Considerations for Companies Bidding on Installation Services

Franklintown has committed to installing a final vegetative cover that produces pollinator health and habitat benefits. Franklintown has developed this Vegetation Management Plan (VMP) to guide the activities of site preparation, installation of prescribed seed mixtures, management and control of invasive species and noxious weeds and the overall management of the established vegetation on the site that will also support those pollinator health and habitat outcomes.

Some of the factors that should be considered when bidding on the Franklintown Solar project include:

1. Obtain the described seed mixture listed in Appendix A and B. All seed mixtures must adhere to the specifications outlined and described in this plan. Species shall be true to the scientific name as specified in the seed mixtures in Appendix A. All seed lots obtained for planting on the Franklintown project must be originally sourced from the United States of America. Any substitutions or changes to the seed mixtures must be approved by Franklintown prior to installation.

2. Full completion of site preparation activities. Proper site preparation is the single, most important factor that will determine both the initial establishment and long-term success of the final vegetative cover planting. Activities will include addressing any soil compaction issues on the site, termination of existing vegetation, determination of the need for using a cover crop on the site and review of previous herbicide use on the site.

3. Seed Mixture Planting. The available planting window for the Franklintown solar seed mixture is determined by two primary factors: soil temperature and the available moisture at both the time of planting and for the next 80 days. Establish the final vegetative cover using one of the approved planting methods during one of the listed available planting timeline windows listed.

4. Seed Mixture Planting Depth. The ideal planting depth for any seed is 2x the diameter of the seed. For the seed mixture designed for the Franklintown Solar project, the appropriate planting depth for the seed mixture is 1/8" and not any deeper.

The expectation is that the final vegetative cover will be fully established after a 3-year period. This does not mean that the final cover is not well-established sooner than a 3-year period, but several species included in the seed mixture become established and produce floral resources over a longer period of time. A successful outcome will be determined by following the guidelines listed in this VMP and the management that occurs in the first 3 years of the project.

Appendix A

Conservation Blueprint

Franklintown Solar - Array Area Seed Mix

20" Vegetative Height Restriction

Species	Scientific Name	PLS lbs per acre	Seeds per sq ft	% of Mixture	Bloom Period	Pollinator Value
Autumn Bentgrass	*Agrostis perennans*	0.300	55.10	8.91%	–	–
Fine Fescue Blend for Solar Projects	*Festuca spp.*	30.000	344.35	55.66%	–	–
Path Rush	*Juncus tenuis*	0.200	73.46	11.87%	–	–
Alsike Clover	*Trifolium hybridum*	2.000	31.24	5.05%	2	5
Birdsfoot Trefoil	*Lotus corniculatus*	3.000	25.47	4.12%	2	5
Ladino or White Clover	*Trifolium repens*	3.000	49.03	7.92%	2	5
White Dutch Clover	*Trifolium repens*	2.000	40.02	6.47%	2	5
	Grasses Total:	30.500	472.911	76.44%		
	Wildflower/Forb/Legume Total:	10.000	145.758	23.56%		
	Filler Total:	0.000	0.000	0.00%		
	Total Mixture:	**40.500**	**618.669**	**100.00%**		

Bloom Period	Wildflowers Used in Mixture	% PLS Seeding Rate of Mix
1 = April to May	0	0.00%
2 = June to July	4	23.56%
3 = August to October	0	0.00%
Total :	4	

5.00	Pollinator Value (0-5)

The Pollinator value score is determined based on a combination of factors described below. A score greater than 4.0 indicates the mixture is designed for great pollinator value.

Bid Cost Per Acre:	
Date of Bid:	
Bid Expiration:	

The Pollinator Value Score is determined based on a combination of factors that include:

The pollen and/or nectar value of the plant species.
The ability of the plant species to establish and persist in pollinator seeding mixtures.
Bee Integrated Program research results of pollinator pollen analysis.
Unique pollinator biological life histories of the plant species.
The total bloom period length of the plant species.
The occurence in early bloom periods (Bloom Period 1) that are hard to challenging to provide resources for.
The commercial availability of the species for use in seeding mixtures.
Value of the plant species pollen and nectar to commercial beekeepers.
USGS Pollinator Library tool: **https://www.npwrc.usgs.gov/pollinator/home**
The Ecoregional Revegetation Application tool: **http://www.nativerevegetation.org/era/**
Botanical and beekeeping reference materials that list the pollinator value of species.
Field observations of floral resource use by pollinator species.

Note: The seed mixture listed and its planting rate are for drill seeding planting methods. Planting rates for Air Seeder, Hydroseeding and Broadcast seeding methods must be increased by 30% (see page 13 and 14 of this plan).

Appendix B

Conservation Blueprint

Franklintown Solar - Buffer Area Seed Mixture

No Vegetative Height Restrictions

Species	Scientific Name	PLS lbs per acre	Seeds per sq ft	% of Mixture	Bloom Period	Pollinator Value
Autumn Bentgrass	*Agrostis perennans*	0.065	11.94	19.29%	--	--
Canada Wildrye	*Elymus canadensis*	0.850	2.22	3.60%	--	--
Little Bluestem	*Schizachyrium scoparium*	0.500	2.76	4.46%	--	--
Path Rush	*Juncus tenuis*	0.035	12.86	20.78%	--	--
American Germander	*Teucrium canadense*	0.010	0.22	0.36%	2	4
Blackeyed Susan	*Rudbeckia hirta*	0.100	3.62	5.85%	2	1
Blanketflower - *G. pulchella*	*Gaillardia pulchella*	0.100	0.43	0.69%	1	4
Blue Vervain	*Verbena hastata*	0.030	1.04	1.67%	2	5
Brown-eyed Susan	*Rudbeckia triloba*	0.050	0.62	1.01%	2	1
Butterfly Milkweed	*Asclepias tuberosa*	0.060	0.10	0.16%	2	5
Canada Goldenrod	*Solidago canadensis*	0.005	0.81	1.31%	2	5
Canada Milkvetch	*Astragalus canadensis*	0.100	0.62	1.00%	2	4
Common Evening Primrose	*Oenothera biennis*	0.030	0.95	1.53%	2	4
Common Milkweed	*Asclepias syriaca*	0.050	0.09	0.15%	2	5
Culver's Root	*Veronicastrum virginicum*	0.001	0.28	0.45%	3	4
Cup Plant	*Silphium perfoliatum*	0.050	0.07	0.12%	2	5
Dotted Mint	*Monarda punctata*	0.020	0.68	1.09%	2	4
False or Oxeye Sunflower	*Heliopsis helianthoides*	0.150	0.36	0.58%	2	5
Foxglove Beardstongue	*Penstemon digitalis*	0.060	0.55	0.89%	1	5
Golden Alexander	*Zizia aurea*	0.100	0.40	0.65%	1	5
Gray Goldenrod	*Solidago nemoralis*	0.010	0.23	0.37%	3	4
Hairy Beardstongue	*Penstemon hirsutus*	0.008	0.73	1.18%	1	5
Heal All	*Prunella vulgaris*	0.030	0.45	0.72%	1	4
Heath Aster	*Symphyotrichum ericoides*	0.006	0.69	1.12%	3	5
Illinois Bundleflower	*Desmanthus illinoensis*	0.300	0.59	0.95%	2	5
Lanceleaf Coreopsis	*Coreopsis lanceolata*	0.200	1.01	1.64%	2	4
Late or Giant Goldenrod, Native Source	*Solidago gigantea*	0.005	0.87	1.40%	3	5
New England Aster	*Symphyotrichum novae-angliae*	0.025	0.61	0.98%	3	5
New Jersey Tea	*Ceanothus americanus*	0.030	0.08	0.12%	2	4
Nodding Pink Onion	*Allium cernuum*	0.035	0.10	0.16%	2	4
Oats	*Avena sativa*	10.000	4.45	7.20%	--	--
Obedience Plant	*Physostegia virginiana*	0.050	0.20	0.33%	3	4
Ohio Spiderwort	*Tradescantia ohiensis*	0.020	0.06	0.09%	1	4
Pale Purple Coneflower	*Echinacea pallida*	0.100	0.24	0.39%	2	5
Plains Coreopsis	*Coreopsis tinctoria*	0.040	2.96	4.78%	2	2
Purple Coneflower	*Echinacea purpurea*	0.200	0.53	0.86%	2	5
Roundhead Lespedeza	*Lespedeza capitata*	0.070	0.28	0.45%	3	4
Seed Box	*Ludwigia alternifolia*	0.001	0.48	0.77%	3	3
Showy Partridgepea	*Chamaecrista fasciculata*	0.400	0.60	0.96%	2	5
Smooth Blue Aster	*Symphyotrichum laeve*	0.020	0.47	0.75%	3	5
Stiff Goldenrod	*Solidago rigida*	0.035	0.54	0.87%	3	5
Swamp Milkweed	*Asclepias incarnata*	0.020	0.07	0.11%	2	5
Tall Boneset	*Eupatorium altissimum*	0.025	0.46	0.74%	3	4
Virginia Mountain Mint	*Pycnanthemum virginianum*	0.005	0.18	0.30%	2	4
Western Yarrow	*Achillea millefolium*	0.050	3.27	5.29%	1	2
Wild Bergamot	*Monarda fistulosa*	0.030	0.88	1.42%	2	5
Wild Quinine	*Parthenium integrifolium*	0.050	0.13	0.21%	2	2
Wild Senna	*Senna hebecarpa*	0.200	0.10	0.17%	2	2
Rice Hulls - Filler for low planting rate mixtures		4.000	0.00	0.00%	--	--
	Grasses Total:	1.450	29.780	48.13%		
	Wildflower/Forb/Legume Total:	12.881	32.094	51.87%		
	Filler Total:	4.000	0.000	0.00%		
	Total Mixture:	**18.331**	**61.875**	**100.00%**		

Bloom Period	Wildflowers Used in Mixture	% PLS Seeding Rate of Mix
1 = April to May	7	9.52%
2 = June to July	25	26.90%

4.12	Pollinator Value (0-5)
The Pollinator value score is determined based on	

Species	Scientific Name	PLS lbs per acre	Seeds per sq ft	% of Mixture	Bloom Period	Pollinator Value
3 = August to October	11	8.24%		*a combination of factors described below. A score greater than 4.0 indicates the mixture is designed for great pollinator value.*		
Total :	43					

The Pollinator Value Score is determined based on a combination of factors that include:

The pollen and/or nectar value of the plant species.
The ability of the plant species to establish and persist in pollinator seeding mixtures.
Bee Integrated Program research results of pollinator pollen analysis.
Unique pollinator biological life histories of the plant species.
The total bloom period length of the plant species.
The occurence in early bloom periods (Bloom Period 1) that are hard to challenging to provide resources for.
The commercial availability of the species for use in seeding mixtures.
Value of the plant species pollen and nectar to commercial beekeepers.
USGS Pollinator Library tool: **https://www.npwrc.usgs.gov/pollinator/home**
The Ecoregional Revegetation Application tool: **http://www.nativerevegetation.org/era/**
Botanical and beekeeping reference materials that list the pollinator value of species.
Field observations of floral resource use by pollinator species.

Note: The seed mixture listed and its planting rate are for drill seeding planting methods. Planting rates for Air Seeder, Hydroseeding and Broadcast seeding methods must be increased by 30% (see page 13 and 14 of this plan).

Appendix C

The available planting dates for Franklintown are determined by a combination of the planting method selected and the predicted environmental conditions over the next 55 to 140 days. Planting seed mixtures outside of the timelines listed for each seed mixture will significantly reduce the likelihood of a full and successful vegetative establishment and will increase the likelihood of weed competition and the sites needing to be reseeded due to poor or non-establishment.

Array Area Seed Mix: Available Planting Dates by Planting Method

Planting Method	Spring		Late Summer		Winter - Dormant Seeding	
	Start Date	End Date	Start Date	End Date	Start Date	End Date
No-till Drill	February 15th	May 31st	August 1st	September 7th	Soil Temp @ 50° F or less	Until the Soil is Frozen
Hydro-seeder	February 15th	May 31st	August 1st	August 23rd	Soil Temp @ 50° F or less	February 15th
Air-seeder	February 15th	May 31st	August 1st	August 23rd	Soil Temp @ 50° F or less	February 15th
Broadcast seeding	February 1st	April 30th	N/A	N/A	Soil Temp @ 50° F or less	February 1st

Buffer Area Seed Mix: Available Planting Dates by Planting Method

Planting Method	Spring		Late Summer		Winter - Dormant Seeding	
	Start Date	End Date	Start Date	End Date	Start Date	End Date
No-till Drill	February 15th	May 31st	N/A	N/A	Soil Temp @ 50° F or less	Until the Soil is Frozen
Hydro-seeder	February 15th	May 31st	N/A	N/A	Soil Temp @ 50° F or less	February 15th
Air-seeder	February 15th	May 31st	N/A	N/A	Soil Temp @ 50° F or less	February 15th
Broadcast seeding	February 1st	April 30th	N/A	N/A	Soil Temp @ 50° F or less	February 1st

Time Needed for Array Area Seed Mixture to Reach Seedling Maturity by Planting Method

Final Vegetative Cover Considerations	No-till Drill	Broadcast Seeding
Seed Germination Timeline	15 to 25 days	30 to 70 days
Minimum Timeline Needed for Seedling Growth & Maturity	40 to 60 days	40 to 70 days
Total Time Needed to Reach Minimal Establishment	**55 to 85 days**	**70 to 140 days**

Time Needed for Buffer Area Seed Mixture to Reach Seedling Maturity by Planting Method

Final Vegetative Cover Considerations	No-till Drill	Broadcast Seeding
Seed Germination Timeline	15 to 60 days	30 to 70 days
Minimum Timeline Needed for Seedling Growth & Maturity	60 to 100 days	70 to 110 days
Total Time Needed to Reach Minimal Establishment	**75 to 160 days**	**100 to 180 days**

Appendix D

Sample Seed Tag with Required Information

CUSTOMER NAME: Any Example Solar Project
LOT NUMBER: 73700
PROJECT NAME: Solar Array Mix

ACRES: 250

SEEDING RATE/ACRE: 100.99

SPECIES	LOT NUMBER	% MIX	ACTUAL PURITY	GERM	HARD/ DORMANT	TOTAL VIABLE	ORIGIN	BULK LBS	PLS LBS
Empire Birdsfoot Trefoil	BV52	0.23	98.68	62	22	84	CAN	0.11	0.095
Empire Birdsfoot Trefoil	BV52	2.72	98.68	62	22	84	CAN	1.38	1.143
Marco Polo White Clover	L17520227WC	0.84	98.96	63	27	90	OR	0.42	0.377
Marco Polo White Clover	L17520227WC	3.01	98.96	63	27	90	OR	1.52	1.356
Dixie Crimson Clover	W822CC221	2.13	99.63	87	6	93	OR	1.07	0.990
Horizon White Proso Millet	2368-TOTE	0.34	99.42	96	0	96	SD	0.17	0.165
Horizon White Proso Millet	2368-TOTE	5.36	99.42	96	0	96	SD	2.69	2.671
Certified Horizon White Proso Millet	VD22WPM1-50	9.45	99.65	98	0	98	SD	4.74	4.632
Certified Horizon White Proso Millet	VD22WPM1-50	10.23	99.65	98	0	98	SD	5.13	5.010
Variety Not Stated Blanketflower	BF211234	0.56	95.35	75	14	89	OR	0.29	0.248
IA Native Gray Goldenrod	200393	0.01	96.56	49	23	72	IA	0.00	0.003
IA Native Gray Goldenrod	220324	0.09	99.63	41	58	99	IA	0.05	0.046
Eagle Western Yarrow	NBSBP20EAG1	0.15	91.16	97	0	97	WA	0.08	0.074
Variety Not Stated Bahiagrass	HSC2233C	12.13	49.00	80	0	80	FL	12.38	4.862
Variety Not Stated Bermudagrass	892180HC	7.13	48.00	86	0	86	CA	7.43	3.030
PA Native Path Rush	JUNTEN0120HW	0.11	93.56	0	93	93	PA	0.06	0.052
PA Native Path Rush	JUNTEN0120HW	0.42	93.56	0	93	93	PA	0.23	0.196
Solar Array Brand Fescue Mix		11.80	48.20	83.94	0	83.94	OR	12.24	4.951

OTHER CROP SEED:	0.11		
INERT MATTER:	33.18	50.00	29.790
WEED SEEDS:	0.01		
TEST DATE:	03/03/23		
NOXIOUS-WEED SEEDS:	NONE FOUND	PLS FACTOR:	0.5958
NET WEIGHT:	50.00 BULK POUNDS		
TOTAL PLS:	29.79 PURE LIVE SEED POUNDS		

Conservation Blueprint - 1070 18th Ave - St. Paul, NE 68873 - AMS #704
THE SELLER DISCLAIMS ANY AND ALL WARRANTIES ASSOCIATED WITH ITS SEED INCLUDING, BUT NOT LIMITED TO, EXPRESS OR IMPLIED WARRANTIES, WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE. LIABILITY FOR DAMAGES IS LIMITED TO THE PURCHASE PRICE OF THE SEED. THIS IS AN EXCLUSIVE REMEDY AND THE SELLER WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Any Example Solar Project
Solar Array Mix
250 Acres - Lot # 73700

Appendix E

Cover Crop Seed Mixture Options

Seed mixture options to be established on those locations calling for the use of a cover crop to provide soil stability and weed suppression during construction activities:

Spring: March to May

- Oats planted at a rate of 90 pounds/acre ..... (40.08 seeds/ft^2)
- Annual Rye at 5 lbs. + Crimson Clover at 10 lbs. + Oats at 25 lbs./acre .....(60.44 seed/ft^2)
- Annual Ryegrass at 10 lbs. + Oats at 30 lbs./acre ..... (52.11 seeds/ft^2)

These seed mixtures will germinate and grow when adequate moisture is present and soil temperatures are 50^0 F or warmer.

Summer: June to August

- German Millet at a rate of 20 lbs./acre .....(82.64 seed/ft^2)

Fall & Winter: September to February

- Planting Cereal Rye at a rate of 100 lbs./acre.....(41.32 seed/ft^2)

This seed mixture will require termination prior to planting the final vegetative cover.

The primary role of a cover crop is to suppress weed competition and growth. For this reason, it is critically important that a cover crop seed mixture be used that has significant allelopathic attributes. Having a plant(s) with an allelopathic nature refers to:

The beneficial or harmful effects of one plant on another plant by the release of chemicals from plant parts by leaching, root exudation, volatilization, residue decomposition and other processes in both natural and agricultural systems. (Allelopathy - Wikipedia)

Appendix F

West Virginia Invasive Plant List

WEST VIRGINIA DNR

Invasive Plant Species of West Virginia
WVDNR Natural Heritage Program, P.O. Box 67, Elkins, WV 26241
Version Mar 2009

Invasiveness ranking

1 Highly invasive species exhibit the most invasive tendencies in natural areas and native plant habitats. They may disrupt ecosystem processes and cause major alterations in plant community composition and structure. They establish readily in natural systems and spread rapidly.

2

Moderately invasive species may have minor influence on ecosystem processes, alter plant community composition, and affect community structure in at least one layer. They may become dominant in the understory layer without threatening all species found in the community. These species usually require a minor disturbance to become established.

3

Occasionally invasive species generally do not affect ecosystem processes but may alter plant community composition by outcompeting one or more native plant species. They often establish in severely disturbed areas. The disturbance may be natural or human origin, such as icestorm damage, windthrow, or road construction. These species spread slowly or not at all from disturbed sites.

Threat	Scientific Name	Common Name
1	*Acer platanoides*	Norway Maple
1	*Ailanthus altissima*	Tree-Of-Heaven
1	*Alliaria petiolata*	Garlic Mustard
1	*Arthraxon hispidus*	Small Carpgrass
1	*Berberis thunbergii*	Japanese Barberry
1	*Bromus tectorum*	Cheatgrass
1	*Celastrus orbiculata*	Asian Bittersweet
1	*Centaurea stoebe ssp. micranthos*	Spotted Knapweed
1	*Coronilla varia*	Purple Crown-Vetch
1	*Dioscorea oppositifolia*	Chinese Yam
1	*Elaeagnus umbellata var. parvifolia*	Autumn Olive
1	*Euonymus alata*	Winged Euonymus, Winged Spindletree
1	*Euonymus fortunei*	Winter Creeper
1	*Hydrilla verticillata*	Hydrilla
1	*Iris pseudacorus*	Yellow Iris
1	*Lespedeza cuneata*	Chinese Bushclover
1	*Ligustrum vulgare*	European Privet
1	*Lonicera japonica*	Japanese Honeysuckle
1	*Lonicera maackii*	Amur Honeysuckle
1	*Lonicera morrowii*	Morrow's Honeysuckle
1	*Lonicera tatarica*	Tatarian Honeysuckle
1	*Lythrum salicaria*	Purple Loosestrife
1	*Microstegium vimineum*	Japanese Stiltgrass
1	*Phalaris arundinacea*	Reed Canarygrass
1	*Phellodendron japonicum*	Cork Tree
1	*Phragmites australis*	Common Reed
1	*Polygonum cuspidatum*	Japanese Knotweed
1	*Polygonum perfoliatum*	Asiatic Tearthumb
1	*Pueraria montana var. lobata*	Kudzu
1	*Pyrus calleryana*	Bradford Pear
1	*Rosa multiflora*	Multiflora Rose
1	*Rubus phoenicolasius*	Wine Raspberry
1	*Schedonorus phoenix*	Tall Fescue
1	*Schedonorus pratensis*	Meadow Fescue

Threat	Scientific Name	Common Name
1	***Sorghum halepense***	**Johnson Grass**
1	***Vinca minor***	**Lesser Periwinkle**
2	*Aegopodium podagraria*	Bishop's Goutweed
2	*Akebia quinata*	Fiveleaf Akebia
2	*Ampelopsis brevipedunculata*	Amur Peppervine
2	*Arctium minus*	Lesser Burdock
2	*Barbarea vulgaris*	Garden Yellow-Rocket
2	*Bromus commutatus*	Meadow Brome
2	*Bromus inermis ssp. inermis var. inermis*	Smooth Bromegrass
2	*Bromus japonicus*	Japanese Brome
2	*Bromus secalinus*	Rye Brome
2	*Bromus sterilis*	Poverty Brome
2	*Carduus nutans ssp. macrolepis*	Nodding Plumeless-Thistle
2	*Centaurea nigrescens*	Wocheiner Knapweed
2	*Chelidonium majus var. majus*	Celandine
2	*Cirsium arvense*	Canada Thistle
2	*Cirsium vulgare*	Bull Thistle
2	*Conium maculatum*	Poison-Hemlock
2	*Cynoglossum officinale*	Gypsy-Flower
2	*Daucus carota*	Queen Anne's-Lace
2	*Dipsacus fullonum*	Fuller's Teasel
2	*Dipsacus laciniatus*	Laciniate Wild Teasel
2	*Duchesnea indica*	Indian-Strawberry
2	*Echium vulgare*	Viper's Bugloss, Bluethistle, Bluedevil
2	*Elaeagnus angustifolia*	Russian-Olive
2	*Frangula alnus*	Glossy False Buckthorn
2	*Glechoma hederacea*	Ground-Ivy
2	*Hesperis matronalis*	Mother-Of-The-Evening
2	*Hieracium caespitosum*	Meadow Hawkweed
2	*Holcus lanatus*	Common Velvetgrass
2	*Hypericum perforatum*	Common St. John's-Wort
2	*Hypochaeris radicata*	Hairy Cat's-Ear
2	*Lespedeza bicolor*	Japanese Bushclover
2	*Leucanthemum vulgare*	Oxeye Daisy
2	*Ligustrum obtusifolium*	Border privet
2	*Linaria vulgaris*	Butter-And-Eggs
2	*Lolium perenne ssp. multiflorum*	Perennial Ryegrass
2	*Lonicera ×bella*	Bell's Honeysuckle
2	*Lonicera standishii*	Standish's Honeysuckle
2	*Lysimachia nummularia*	Creeping Jenny
2	*Melilotus officinalis*	Sweetclover
2	*Myriophyllum aquaticum*	Parrot's-Feather
2	*Myriophyllum spicatum*	Eurasian Water-Milfoil
2	*Ornithogalum nutans*	Drooping Star Of Bethlehem
2	*Ornithogalum umbellatum*	Star Of Bethlehem
2	*Pastinaca sativa*	Parsnip
2	*Paulownia tomentosa*	Princess-Tree
2	*Perilla frutescens*	Beefsteak Plant
2	*Poa compressa*	Canada Bluegrass
2	*Poa pratensis ssp. pratensis*	Kentucky Bluegrass
2	*Poa trivialis*	Rough Bluegrass
2	*Polygonum caespitosum var. longisetum*	Oriental Lady's-Thumb
2	*Polygonum sachalinense*	Giant Knotweed
2	*Potamogeton crispus*	Curly Pondweed
2	*Ranunculus ficaria var. bulbifera*	Lesser Celandine
2	*Rhamnus cathartica*	Common Buckthorn

Threat	Scientific Name	Common Name
2	*Rorippa nasturtium-aquaticum*	Watercress
2	*Rumex acetosella*	Common Sheep Sorrel
2	*Sedum sarmentosum*	Stonecrop
2	*Spiraea japonica var. fortunei*	Japanese Spiraea
2	*Stellaria media*	Common Chickweed
2	*Stellaria media ssp. media*	Common Chickweed
2	*Stellaria media ssp. pallida*	Common Chickweed
2	*Ulmus pumila*	Siberian Elm
2	*Verbascum thapsus*	Great Mullein
3	*Achillea millefolium var. occidentalis*	Western Yarrow
3	*Acinos arvensis*	Mother-Of-Thyme, Basil-Thyme
3	*Agrostemma githago*	Corn Cockle
3	*Agrostis canina*	Velvet Bent Grass
3	*Agrostis capillaris*	Colonial Bentgrass
3	*Agrostis gigantea*	Giant Bentgrass
3	*Agrostis stolonifera*	Creeping Bentgrass
3	*Ajuga reptans*	Blue Bugle
3	*Albizia julibrissin*	Silktree
3	*Allium vineale ssp. vineale*	Wild Garlic, Crow Garlic
3	*Alternanthera philoxeroides*	Alligator weed
3	*Anthoxanthum odoratum ssp. odoratum*	Sweet Vernal Grass
3	*Arrhenatherum elatius*	Tall Oatgrass
3	*Arrhenatherum elatius var. elatius*	Tall Oat-Grass
3	*Artemisia annua*	Annual Wormwood
3	*Artemisia vulgaris var. vulgaris*	Common Mugwort
3	*Arundo donax*	Giant Reed
3	*Berberis vulgaris*	European Barberry
3	*Broussonetia papyrifera*	Paper-Mulberry
3	*Buglossoides arvensis*	Corn Gromwell
3	*Cardamine impatiens*	Bittercress
3	*Carduus acanthoides*	Spiny Plumeless-Thistle
3	*Carduus crispus*	Curled Thistle
3	*Centaurea cyanus*	Garden Cornflower
3	*Centaurea jacea*	Brown Knapweed
3	*Centaurea nigra*	Black Knapweed, Spanish-Buttos
3	*Centaurea solstitialis*	Yellow Starthistle
3	*Cerastium fontanum ssp. vulgare*	Common Mouse-Ear Chickweed
3	*Cerastium glomeratum*	Sticky Mouse-Ear Chickweed
3	*Chenopodium album var. album*	Lamb's Quarters
3	*Chenopodium ambrosioides var. ambrosioides*	Mexican Tea
3	*Cichorium intybus*	Chicory, Blue Sailors
3	*Commelina communis*	Asiatic Dayflower
3	*Commelina communis var. communis*	Asiatic Day-Flower
3	*Convolvulus arvensis*	Field Bindweed
3	*Cosmos bipinnatus*	Common Cosmos
3	*Cruciata pedemontana*	Piedmont Bedstraw
3	*Cynodon dactylon*	Bermuda Grass
3	*Dactylis glomerata ssp. glomerata*	Orchard Grass
3	*Datura stramonium*	Jimson Weed
3	*Dianthus armeria*	Deptford-Pink
3	*Egeria densa*	Brazilian water-weed
3	*Eleusine indica*	Goose Grass, Yard Grass
3	*Elymus repens*	Creeping Wild Rye
3	*Epilobium hirsutum*	Hairy Willow-Herb
3	*Eragrostis cilianensis*	Stinkgrass
3	*Eragrostis curvula*	Weeping Lovegrass

Threat	Scientific Name	Common Name
3	*Euphorbia esula var. esula*	Leafy Spurge
3	*Euphorbia lathyris*	Caper Spurge, Mole Plant, Wolf's-Milk
3	*Foeniculum vulgare*	Sweet Fennel
3	*Galium mollugo*	False Baby's-Breath
3	*Hedera helix*	English Ivy
3	*Hemerocallis fulva*	Common Day Lily
3	*Hemerocallis lilioasphodelus*	Yellow Day Lily
3	*Hibiscus syriacus*	Rose-Of-Sharon, Shrubby Althea
3	*Hieracium ×floribundum*	Smooth Hawkweed
3	*Hieracium aurantiacum*	Devil's Paintbrush
3	*Hieracium pilosella var. pilosella*	Mouse-Ear Hawkweed
3	*Hieracium piloselloides*	Tall Hawkweed
3	*Humulus japonicus*	Japanese Hop
3	*Ipomoea coccinea*	Red Morning-Glory
3	*Ipomoea hederacea*	Ivy-Leaved Morning-Glory
3	*Ipomoea purpurea*	Morning-Glory
3	*Kummerowia stipulacea*	Korean Bushclover
3	*Kummerowia striata*	Japanese-Clover
3	*Lactuca saligna*	Willow Lettuce
3	*Lamium amplexicaule*	Henbit
3	*Lamium purpureum var. purpureum*	Purple Dead-Nettle
3	*Lapsana communis*	Nipplewort
3	*Leonurus cardiaca ssp. cardiaca*	Motherwort
3	*Lepidium campestre*	Cream-Anther Field Pepperwort
3	*Lepidium densiflorum var. densiflorum*	Dense Peppergrass
3	*Lepidium perfoliatum*	Clasping Pepperwort
3	*Lepidium ruderale*	Stinking Pepperweed
3	*Ligustrum sinense*	Chinese privet
3	*Lonicera fragrantissima*	Sweet Breath Of Spring
3	*Lotus corniculatus*	Garden Bird's-Foot-Trefoil
3	*Malva moschata*	Musk Mallow
3	*Malva neglecta*	Common Mallow
3	*Malva sylvestris*	High Mallow
3	*Malva verticillata*	Whorled Mallow, Curled Mallow
3	*Marrubium vulgare*	White Horehound
3	*Medicago lupulina*	Black Medic
3	*Mentha ?×verticillata*	Whorled Mint
3	*Mentha ×gracilis*	Small-Leaved Mint
3	*Mentha ×piperita*	Peppermint
3	*Mentha ×rotundifolia*	Roundleaf Mint
3	*Mentha aquatica*	Water Mint
3	*Mentha spicata*	Spearmint
3	*Microthlaspi perfoliatum*	Perfoliate Pennycress
3	*Miscanthus sinensis*	Chinese Silver Grass
3	*Morus alba*	White Mulberry
3	*Murdannia keisak*	Aneilema
3	*Muscari botryoides*	Grape Hyacinth
3	*Myosoton aquaticum*	Giant Chickweed
3	*Najas minor*	Brittle Waternymph
3	*Nepeta cataria*	Catnip
3	*Papaver dubium*	Scarlet Poppy
3	*Pennisetum glaucum*	Pearl-Millet
3	*Phalaris canariensis*	Canary Grass
3	*Phleum pratense*	Timothy
3	*Phyllostachys aureosulcata*	Golden Bamboo
3	*Phyllostachys nigra*	Black Bamboo

Threat	Scientific Name	Common Name
3	*Picea abies*	Norway Spruce
3	*Poa annua*	Annual Bluegrass
3	*Polygonum aviculare*	Yard Knotweed
3	*Polygonum convolvulus var. convolvulus*	Black Bindweed
3	*Polygonum orientale*	Prince's Feather
3	*Polygonum persicaria*	Spotted Lady's-Thumb
3	*Populus alba*	White Poplar
3	*Potentilla recta*	Sulphur Cinquefoil
3	*Prunella vulgaris*	Common Self-Heal
3	*Prunus avium*	Sweet Cherry
3	*Prunus mahaleb*	Perfumed Cherry
3	*Ranunculus acris var. acris*	Tall Buttercup, Meadow Buttercup
3	*Ranunculus arvensis*	Corn Crowfoot
3	*Ranunculus bulbosus*	Bulbous Buttercup
3	*Ranunculus flammula var. filiformis*	Greater Creeping Spearwort
3	*Ranunculus repens*	Creeping Buttercup
3	*Ranunculus sardous*	Hairy Buttercup
3	*Raphanus raphanistrum*	Wild Radish
3	*Rhodotypos scandens*	Jetbead, White Kerria
3	*Rorippa sylvestris*	Creeping Yellowcress
3	*Rosa canina*	Dog Rose
3	*Rosa eglanteria*	Sweetbrier
3	*Rubus illecebrosus*	Strawberry-Raspberry
3	*Rumex crispus ssp. crispus*	Curly Dock
3	*Salix alba*	White Willow
3	*Saponaria officinalis*	Bouncing-Bet
3	*Senecio vulgaris*	Common Groundsel
3	*Senna obtusifolia*	Coffeeweed
3	*Setaria faberi*	Giant Foxtail-Grass
3	*Setaria italica*	Foxtail Millet
3	*Setaria verticillata*	Bristly Foxtail
3	*Setaria viridis var. viridis*	Green Foxtail
3	*Silene latifolia ssp. alba*	White Campion
3	*Sisymbrium altissimum*	Tall Hedge-Mustard
3	*Sisymbrium officinale*	Hedge Mustard
3	*Solanum dulcamara var. dulcamara*	Bittersweet
3	*Sonchus arvensis ssp. uliginosus*	Field Sowthistle
3	*Sonchus asper ssp. asper*	Spiny Sow Thistle
3	*Sonchus oleraceus*	Common Sowthistle
3	*Stellaria graminea*	Lesser Stitchwort
3	*Torilis arvensis ssp. arvensis*	Hedge Parsley
3	*Tragopogon dubius*	Meadow Goat's-Beard
3	*Trapa natans*	Water chestnut
3	*Trifolium arvense*	Rabbit-Foot Clover
3	*Trifolium aureum*	Yellow Hop Clover
3	*Trifolium campestre*	Low Hop Clover
3	*Trifolium dubium*	Small Hop Clover
3	*Trifolium hybridum*	Alsike Clover
3	*Trifolium incarnatum*	Crimson Clover
3	*Trifolium pratense*	Red Clover
3	*Trifolium repens*	White Clover
3	*Trifolium resupinatum*	Reversed Clover
3	*Tussilago farfara*	Colt's-Foot
3	*Typha ×glauca*	Cattail
3	*Urtica dioica ssp. dioica*	Stinging Nettle
3	*Veronica arvensis*	Corn Speedwell

Threat	Scientific Name	Common Name
3	*Veronica beccabunga*	European Brooklime
3	*Veronica chamaedrys*	Bird's-Eye Speedwell
3	*Veronica filiformis*	Filiform Speedwell
3	*Veronica hederifolia*	Ivyleaf Speedwell
3	*Veronica longifolia*	Long-Leaved Speedwell
3	*Veronica officinalis var. officinalis*	Common Speedwell, Gypsyweed
3	*Veronica persica var. persica*	Bird's Eye Speedwell
3	*Veronica polita*	Field Speedwell
3	*Veronica serpyllifolia ssp. serpyllifolia*	Thyme-Leaved Speedwell
3	*Viburnum opulus var. opulus*	Guelder-Rose
3	*Vicia cracca ssp. cracca*	Vetch
3	*Vicia grandiflora*	Large-Flowered Vetch
3	*Vicia hirsuta*	Vetch
3	*Vicia sativa ssp. nigra*	Common Vetch
3	*Vicia sativa ssp. sativa*	Spring Vetch
3	*Vicia sepium var. sepium*	Bush Vetch
3	*Vicia tetrasperma*	Four-Seeded Vetch
3	*Vicia villosa ssp. varia*	Hairy-Fruit Vetch
3	*Vicia villosa ssp. villosa*	Hairy Vetch
3	*Wisteria floribunda*	Japanese Wisteria
3	*Wisteria sinensis*	Chinese Wisteria
3	*Xanthium spinosum*	Spiny Cocklebur

Appendix G

Solar/Pollinator-friendly Seed Mixture Design Objectives For Franklintown Solar

The seed mixtures recommended for this solar project have been designed considering a wide range of co-equal, critically important and diverse set of objectives. While it is very challenging to meet each of the objectives listed in this summary, it can be accomplished with a very careful and thoughtful consideration of how these objectives are met and delivered. If a seed mixture design does not consider each of these objectives, it will very likely fail to deliver on one or more of the important objectives of the project.

Project Objectives Considered for Array Area Seed Mixture Design

1. **Vegetative Height Restrictions**. Increasingly, utility-scale solar projects are being designed with a lower panel height of 20" to 22" above the ground. Under those situations, a seed mixture established within the array area should be designed to have a maximum growth height of 18" to 20". While this objective produces significant constraints on how a seed mixture is designed, it is a critically important consideration that affects future Operations & Maintenance efforts, budget and the efficiency of the energy production on the site.

2. **Pollinator Value:** One of the key objectives of this site is to provide significant pollinator health and habitat benefits for a wide range of pollinating insects, birds, and mammals. The plant species used in the seed mixture designs for this site have a documented high pollinator value, extend their pollinator benefits over an entire growing season, and are designed to benefit a wide range of pollinator species.

3. **Carbon Sequestration Benefits:** The project goal of sequestering carbon from the atmosphere is a key component of the seed mixture design and function. Using plant species in seed mixtures like clover (*Trifolium* spp.) that are known to sequester carbon at higher rates and produce lignin can help meet these current and future objectives. The opportunity to 'bank carbon credits' is a potential vehicle by which the project can help meet sustainability, greenhouse gas emission and carbon neutral goals.

4. **Ease of Establishment**: In order to meet the requirements of a Conditional Use Permit (CUP) and/or Stormwater Pollution Prevention Plan (SWPPP), it is important that seed mixtures be designed to establish quickly. If a seed mixture were designed with a focus solely on use of native wildflowers or warm-season grass species, it would take an extended period of time for the site to reach full establishment. For this reason, the use of cover crops and/or plant species that establish quickly are being used in seed mixture designs.

5. **Response to Future Mowing Activities**: Once established, the seed mixture designed for use within the array area will likely experience mowing activities applied to manage and control weed growth on the site. It is critically important to select plant species in the seed mixture that can withstand the mowing pressure and persist on the site for 20 to 30 years. Unfortunately, most native wildflower and/or warm-season grass species cannot withstand the mowing pressure at a rate of 2x per year and would disappear from the planting within just a few years. In addition, native wildflower species that can withstand mowing pressure and meet the vegetative height restrictions of the project usually have significant commercial availability limitations.

6. **Cost-effectiveness of the Seed Mixtures**: For large, utility-scale projects, it is important that the cost of pollinator-friendly seed mixtures be presented in a cost-effective design and seeding rate. With careful consideration, the seed mixture for this site was designed to meet those cost objectives. Often, seed mixtures that emphasize the exclusive use of native grasses and wildflower species produce seed mixture that exceed project budgets and range from $600 to $2,000/acre because of the limited ability to access native wildflower species that meet all the rest of the objectives in this summary such as maximum growing height and ability to withstand periodic mowing.

7. **Seeding Rates:** For seed mixtures created and required to be used on the project are designed using a PLS seeds/ft^2 seeding rate of between 525 and 700 seeds/ft^2. This is a seeding rate that is significantly higher than would be designed and used on most conservation program plantings. The increased seeding rates are required to consider project and stand establishment factors like broadcast seeding, poor initial site preparation, planting outside of recommended timelines, initial weed competition, etc.

8. **Commercial Availability**: The size of utility-scale projects and the number of projects scheduled for completion in the next few years are placing a significant demand on the seed industry to have enough supply available to fill the demand for seed. If a seed mixture is designed using species that are not commercially available or are in a limited supply, it will significantly increase the cost of seed mixtures and place limitations on the ability to acquire those seed mixtures.

9. **Longevity and Ability to Persist in Plantings:** Most solar energy projects are leased for a minimum of 20 to 35 years. As such, it is important to select plant species with a documented ability to persist in plantings with minimal and limited future management. Most native wildflower and warm-season grass species require some form of regular, annual management activities to be maintained in a planting. Since some of the tools that would regularly be used to maintain this plant diversity (prescribed fire, cattle grazing, interseeding, etc.) are not an option on solar projects, plant species must be selected that are dominate and/or aggressive enough to be maintained with the limited options of mowing and/or herbicide application.

10. **Adaptation to the Geography and Site Conditions**: Seed mixtures should be designed to include plant species that are known to occur in the project area and perform well on the site's soil conditions (sandy, loamy, clay, etc.). This will help ensure a higher likelihood of successful establishment of the seed mixture planted. The resource used to document adaptation to the project's location is *The Biota of North America Program* (2014 BONAP North American Plant Atlas).

11. **Tolerance to Partial Shading**: Plant species (both grasses and forbs) that are known to tolerate and perform well in partial shading or areas with less than full sunlight is required in the Array Area seeding mixture. The use of Fescue and White Dutch Clover in array areas seed mixtures are known to perform well under those conditions and meet all the other listed set of objectives in this summary.

12. **Mixtures Designed Using PLS Seeds/ft^2 Calculations**: In order to design a seed mixture that considers the seeding rates, cost and quality of the seed lots used in a mixture, every seed mixture must be bid, acquired and planted using a seed calculator that applies PLS seeds/ft^2 technology. Seed mixtures should not be designed or used that are based on the number of pounds of seed/per acre. Using the more antiquated methods of pounds/acre will result in higher costing seed mixtures, potentially obtaining seed mixtures with lower performance and creating a project with a slower to establish final vegetative cover.

13. **Erosion Control Attributes**: Seed mixtures should be designed to establish quickly and provide extensive root growth in the top portion of the soil horizon. This will produce an increased ability to hold soil, prevent erosion and limit weeds on the site, especially during the establishment phase of the project. Seed mixtures that are being planted in the spring should consider the inclusion of Oats as a nurse crop to aid in establishment and protect newly establishing plantings during hot and dry summer months.

14. **Soil Health Benefits**: Seed mixtures that perform with increased soil health benefits, extended root depths, nitrogen-fixing capabilities and enhanced water percolation attributes will produce both short-term and long-term benefits that will benefit the site for many years to come.

15. **Fire Danger Considerations**: Seed mixtures designs that contain species that exceed a vegetative height of >22" tall at maturity and/or that have a warm-season growth cycle will have a higher danger of being susceptible to fire. The seed mixtures recommended for use within the solar array area of the project have been selected based on their low vegetative height at maturity and their cool-season growth cycle ability to have active, 'green' growth throughout the entire growing season.

16. **Albedo Affects**: As solar panel efficiencies increase and their overall costs decrease, more and more solar energy projects are being constructed with bi-facial panel designs. To increase the energy produced in a bi-facial panel design project, including plant species with documented, increased Albedo affects like white Dutch clover (*Trifolium repens*) will increase the projects overall efficiency and energy production.

17. **Grazing Considerations**: If grazing is a consideration for the future O&M activities on a solar project, the seed mixture should be designed to include species that provide grazing value and are able to maintain pollinator health and habitat benefits under grazing activities. The ability to deliver both pollinator health benefits with grazing activities is very challenging and the site should apply and follow a Grazing Management Plan. Grazing activities will need to be delivered in a plan that implements grazing paddocks, rotational grazing and refugee areas of the project on an annual basis.

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Appendix H

July

A Solar Array Area seed mixture showing broadcast seeding establishment just 2 months after being planted. This photo represents the time when mowing should be applied as management activity in year 1. The volunteer weed species present in this image include: Mare's Tail, Giant Ragweed, Pigweed, Curl Dock, Dandelion and Velvet Leaf.

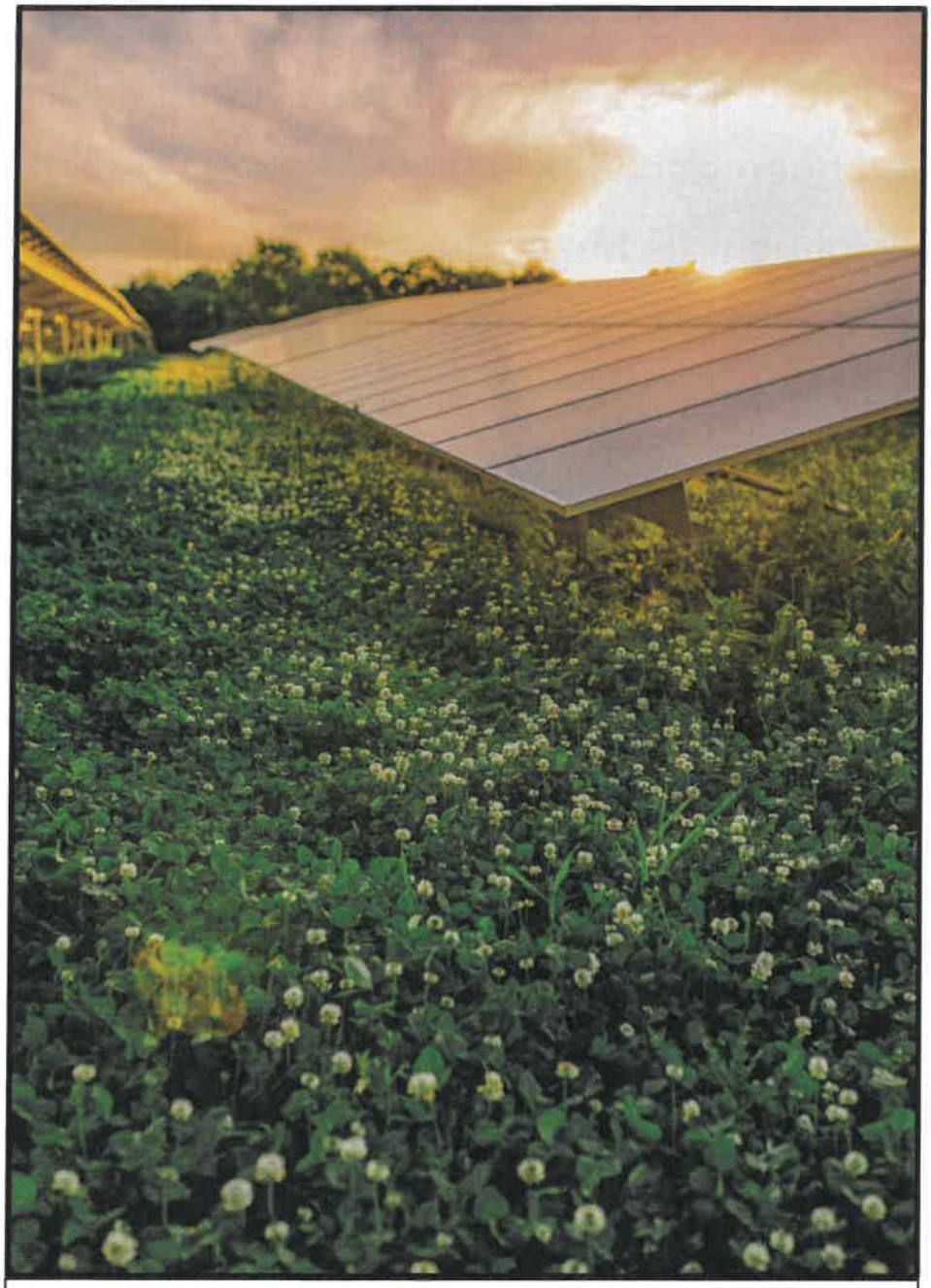
If allowed to grow without management activities being applied, these weed species will quickly outcompete the array area seed mix, being to bring allelopathic impacts to the planting and threaten the overall success of the final vegetative cover.

Appendix I

November

A Solar Array Area seed mixture showing no-till drill planting establishment just 4 months after being planted. This area was planted pre-construction and has had two mowing activities applied to it in the first growing season. This stand is well on its way to outcompeting volunteer weed species, providing key pollinator benefits and becoming fully established. In the future, this solar array area seed mixture will need minimal management activities applied to it and should not grow taller than the lower panel height.

Appendix J



June

A Solar Array Area seed mixture showing broadcast seeding establishment in its second year after being planted. This area was planted pre-construction and had three mowing activities applied to it in the first growing season. This stand is fully established and will need minimal management activities applied to it going forward.

Appendix K

On the charts below, we've listed all plant genera that had been visited by at least 4 different species of bumble bees. The blue bar represents the number of bumble bee visits to each genus, while the orange dot represent the number of bumble bee species that visited each genus.

1

2