

# Syndicate Park Dunes Stabilization and Monitoring Plan

Syndicate Park Sub division, Van Buren  
County, MI

February 16, 2016

Cardno Project No. J151517400



## Document Information

Prepared for            Van Buren County  
Project Name            Syndicate Park Dunes Stabilization and Monitoring Plan  
Project Number        Cardno J151517600  
Project Manager        Joe von Wahlde  
Date                      February 16, 2016



Financial assistance for this project was provided, in part, by the Michigan Coastal Zone Management Program, Office of the Great Lakes, Department of Environmental Quality, under the National Coastal Zone Management Program, through a grant from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

The statements, findings, conclusions, and recommendation in this report are those of Van Buren County and do not necessarily reflect the views of the Department of Environmental Quality and the National Oceanic and Atmospheric Administration.

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# 1 Introduction

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**1.1** Cardno was contracted by Abonmarche Consultants in April, 2015 to assist in the preparation of a dune stabilization plan and prepare a monitoring plan for the area known as the Syndicate Park Dunes (Figure 4) on behalf of project stakeholders including; Van Buren Board of Commissioners and the Southwest Michigan Planning Commission (SWMPC). The subject properties are located along the eastern shore of Lake Michigan at Syndicate Park in South Haven Township, Van Buren County. The project will encompass parcels under ownership of Van Buren County between Syndicate Park residential development and the lakeshore.

In 2012, the findings of a study conducted by the SWMPC recommended a dune restoration effort be initiated at Syndicate Park Dunes. A follow up assessment conducted in 2013 by the Geology Department at Calvin College, *Investigation of the Syndicate Park Dune Area*, (Vander Bilt et al 2013) developed detailed recommendations for dune stabilization and management at this site. This Management Plan has been developed based on the management strategy laid out in that document.

## 2 Background Information

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### **2.1** Regulatory Implications

The Great Lakes Dunes are a unique and fragile natural feature on the landscape. Regionally, these ecosystems occur in places where historically, glaciation and lake level fluctuations have had the greatest influence on geomorphology. Along the eastern shore of Lake Michigan natural dune complexes represent the most direct interface between the lake environment and the adjacent terrestrial environment. As such, the natural function of these features plays a key role in regional ecology and hold an important place in the natural and cultural heritage of the lakeshore region.

Legislation was enacted to facilitate the conservation and management of coastal dunes within the state under the Michigan Natural Resource and Environmental Protection Act (NREPA), part 353 (Sand Dunes Protection and Management), 325 (Great Lakes Submerged Lands) and 323 (Shorelands Protection and Management) of Act 451. The Michigan Department of Environmental Quality (MDEQ) is charged with regulating any earth changes within the designated “Critical Dune Areas” around the state. The “Atlas of Critical Dune Areas” was established in 1989 by the Michigan Department of Natural Resources (DNR) to codify the regulated areas and make this area known to the public. High Risk Erosion Areas are dune habitats not designated as “Critical Dunes” but nevertheless protected due to the risk factors involved with site development within sand dune substrates.

Any activity to be undertaken at the Syndicate Dunes site must undergo MDEQ project application review prior to authorization under part 353 because it is located within a designated “critical dune area”. Since the early conception of this project, MDEQ Project Manager John Bayha of the Kalamazoo District Office has been engaged in the planning stages.



## 2.2 Project Area Description

A recent study undertaken by the SWMPC describes the Syndicate Dunes complex as “shifting at an increasing rate” and “mostly devoid of stabilizing vegetation due to human impact” based on aerial photo records dating between 1938 and 2010. (Vander Bilt 2013 et al). For the purposes of this management plan, the dune complex consists of three distinct blowout areas and their corresponding slip faces. Fourteen blow-out areas were identified in the Calvin College assessment in various stages ranging from very active to inactive. Our dune restoration will focus on the three major active blowouts or deflation areas access to the lakeshore over the dunes from nearby residences and public parking area. These unimproved access points are the genesis of the de-vegetation and subsequent erosion of the dune.

The dune complex rises from 579 feet above mean sea level at the lake surface to a high point of 761 feet near blow-out area three (Attachment B). The existing vegetation on the dune consists primarily of American beach grass also called marram grass (*Ammophila breviligulata*). This is a pioneering species which is an indicator that this is an active dune where sand deposition makes vegetation establishment a challenge to other species. Within the blowout area a buried Paleosol soil layer is partially exposed which suggests that at some point in the distant past, this dune complex was stable and had enough rooted vegetation to create organic soil.

The Syndicate Park Dunes site is a popular destination for tourists as well as local residents. Studies conducted by Calvin College Department of Geology indicate that people from up to seven states visited the site arriving from one of the 38 unimproved trails as well as from boats off shore. Off road vehicles (ORV) are commonly driven on site utilizing multiple trails, some of which are well worn and heavily eroded.

## 3 Project Goals and Methods

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Three primary goals of the project as stated by the project proponents are; 1.) Stabilize the dune and prevent its advancement eastward to preserve private residential properties inland 2.) Preserve, stabilize and manage overland access to the dune complex and the lakeshore beyond for public use 3.) Provide public education and facilitate awareness of the Great Lakes Dunes ecosystem and its intrinsic value to the public and to the environment. This plan has been developed to meet project goals and to address the concerns of the people of Van Buren County in regards to the conservation approach and continued public access to an important part of the community's natural heritage.

### 3.1 Dune Stabilization

Three blow-out areas have developed on the west facing side of the dune with corresponding slip faces on the eastern toe of slope. The prevailing wind along the lake shore comes predominantly from the west leaving significant deflation areas where bare sand is currently present along the western aspect. These areas of bare sand without vegetation are a significant source of the material depositing on the slip face and advancing the dune. Additional bare sand areas are the result of access trails where vegetation has been disturbed by foot traffic and ORV passage. These areas are interspersed throughout the site along contours and across contours contributing heavily to the erosion process.

Vegetation establishment is the most effective and sustainable method of stabilization in an active dune landscape. Well established root mat structures hold fast sand and soil particles while the above surface structure of the plant attenuates the erosive energy of the wind against once bare surfaces. Fencing or permanent structures may be erected to manipulate wind currents and material deposition. These structures will eventually be covered over by deposition or may require repeated maintenance and upkeep. Physical structures serve best as a supplement to vegetative restoration and carefully managed access trails. Refer to section 4 (Planting Plan) of this report for details regarding the installation location and species list.

### 3.2 Access Controls

The Syndicate Park Dunes area has been a popular destination for summer recreational activities since at least the early twentieth century. Uncontrolled access to the lakeshore by walking or driving over the dunes through the years has resulted in an extensive network of well-worn and erosive trails (Figure 1). These bare sand trails cut across and along contours contributing significantly to site erosion and degradation by supplying transient materials as well as creating blow-outs and deflation areas. It is critical to the dune stabilization effort to decommission a large portion of these trails and maintain a limited access policy to allow vegetation establishment and inhibit the erosion process.

The continuation of public access to the resource is however a key project objective and therefore necessitates the continued use of a portion of the trail network. Two existing trails will be retained and improved (Figure 3) and these will represent the only public access to the active dune areas. The remaining trails will be fenced at entrance and exit points excluding access to allow vegetation establishment. Recreational access and activities in The Syndicate Park Dunes area has not been historically excluded from the slopes of the dune. Exclusionary fencing will be erected to limit access to the dune slopes (Figure 2, 3, 4) to similarly allow vegetation to establish and stabilize the dune.

Public education and outreach is a key factor in successful dune management. In a place where public access was previously unlimited, there will now be strict limits to activities and lakeshore approach on the site. The only way that these goals can be achieved is through public cooperation. In an effort to increase public support of the project, interpretive signage will be placed at the proposed trail access points. This signage will attempt to convey the message of dune conservation and its value to the region through concise narrative and graphical representation.

### 3.3 Long Term Monitoring

Aerial photography and historical survey have provided a baseline estimation of parabolic dune advancement. A more accurate depiction of the rate and location of changes in the slip face of the dune can be produced through long term monitoring of fixed reference positions. Across the slip face on the eastern toe of slope, 18 fixed monitoring points consisting of eight feet tall by six inch diameter wooden posts will be placed and geo-referenced using global positioning system. By establishing the post centroid as the zero point and measuring the distance from and height of burial (where applicable), the migration of the slip face can be quantified. To achieve a site level picture of dune advancement these posts are to be placed along the toe of each existing aspect of the slip face toe and measured annually in the spring.

### 3.4 Success Criteria

No environmental restoration plan can be said to have been successful without some measurable result. There are empirical and observable indicators inherent in this monitoring and maintenance plan that will provide some evidence of successfully meeting project goals and objectives. Success criteria for the stabilization effort may include; 1.) Percent of the total area as bare sand based on visual estimation 2.) Percent of the total planting area with established plant community and 3.) Dune advancement status based on erosion pin measurements.

Monitoring frequency will be seasonally appropriate in relation to the criteria to be measured. Wind erosion, Aeolian sediment transport and deposition are most prevalent in the months outside the growing season. Dune advancement from one year to the next may be most observable in the early spring. Vegetation coverage estimates could be skewed if observations are made outside the growing season. Condition assessment using the Dune Features Inventory Checklist form attached in Appendix A will take place in the summer months when the vegetative community is at the peak of its growing season. The form provides a narrative indication of dune activity but, supplemental notes regarding the success criteria including the percent cover of vegetation and the degree to which visitors are adhering to the access exclusions will factor into project success.

## 4 Planting Plan

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### 4.1 Species Selection and Installation

In a natural setting, fresh deposition areas along the slip face and within the deflation zones are most suitable to pioneering plant species which perform the initial stabilization function. After the shifting sands are adequately stabilized by these species the microclimate and ground conditions begin to change and become suitable for secondary growth species increasing overall diversity within the community.

The goal of this stabilization plan is to supplement the natural colonization of pioneering species through direct plantings of native species. Where conditions are appropriate deep rooting and woody species will be introduced to enhance soil stabilization in the shaded margins along the toe of the slip face (Figure 3).

### 4.2 Success Criteria

Successful establishment of supplemental vegetation plantings can be measured by direct observation. During the annual dune assessment surveys, estimated percent cover over exposed areas can be visually estimated. A steady increase over time should be noted from season to season and species diversity should increase as well over time given the creation of favorable conditions for natural recruitment.

## 5 Maintenance Plan

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As with any maintenance plan, the frequencies and methodologies set forth in this document will likely need to be adjusted in practice. While prevailing winds can be assumed and growing condition be comprised of predictable factors the human factor is a key component to this stabilization and Maintenance Plan. Assuming that foot traffic and ORV traffic on the decommissioned trails and that the planted bare sand areas are avoided by recreational visitors, then maintenance will be limited to the replacement of low surviving plant materials and keeping fences free of extensive deposition.

### 5.1 Project Condition Monitoring

During the annual summer vegetation monitoring, notes will be taken on percent survival based on visual estimate. In keeping with project goals to limit disturbance from foot travel, direct traverse over the planted areas will not be included in surveys. Observations will be made from the two public trails, the observation area, the toe of the slip face and from the beach. Fixed and repeatable photo points will be established during the year one monitoring and recorded using a hand held GPS unit.

Where low survival is noted, a re-planting strategy will be devised with a focus on the limitation of disturbance and identifying causation where applicable. Where sand erosion or deposition occurs outside of predicted or desired areas, notes will be taken regarding location, magnitude and causation. An action plan to remediate, stabilize or take no action can then be devised based on information collected. Trail condition and exclusionary fence status will be documented and similarly maintained through observation and a modular approach maintenance action plan development.

### 5.2 Invasive Species Management

During the pre-project field visits conducted on May 6<sup>th</sup> and May 7<sup>th</sup> 2015, a general site assessment was made during the walkover and visual inspection. No significant infestation of invasive species were noted in the vegetative community among the blow out areas or along the slip face. Many of the invasive plant species of concern in the region adapt extremely well to disturbance. Species such as common reed (*Phragmites australis*) and spotted knapweed (*Centaurea maculosa*) tend to be among the earliest colonizers at disturbed sites often resulting in the biological suppression of the native species. Monitoring efforts at the Syndicate Park Dunes site will include notes on species assemblage based on the observation stations established to describe vegetation establishment in the blow outs. If invasive species are observed, then a separate management strategy will be devised to suppress or eradicate their proliferation throughout the site.

## 6 References

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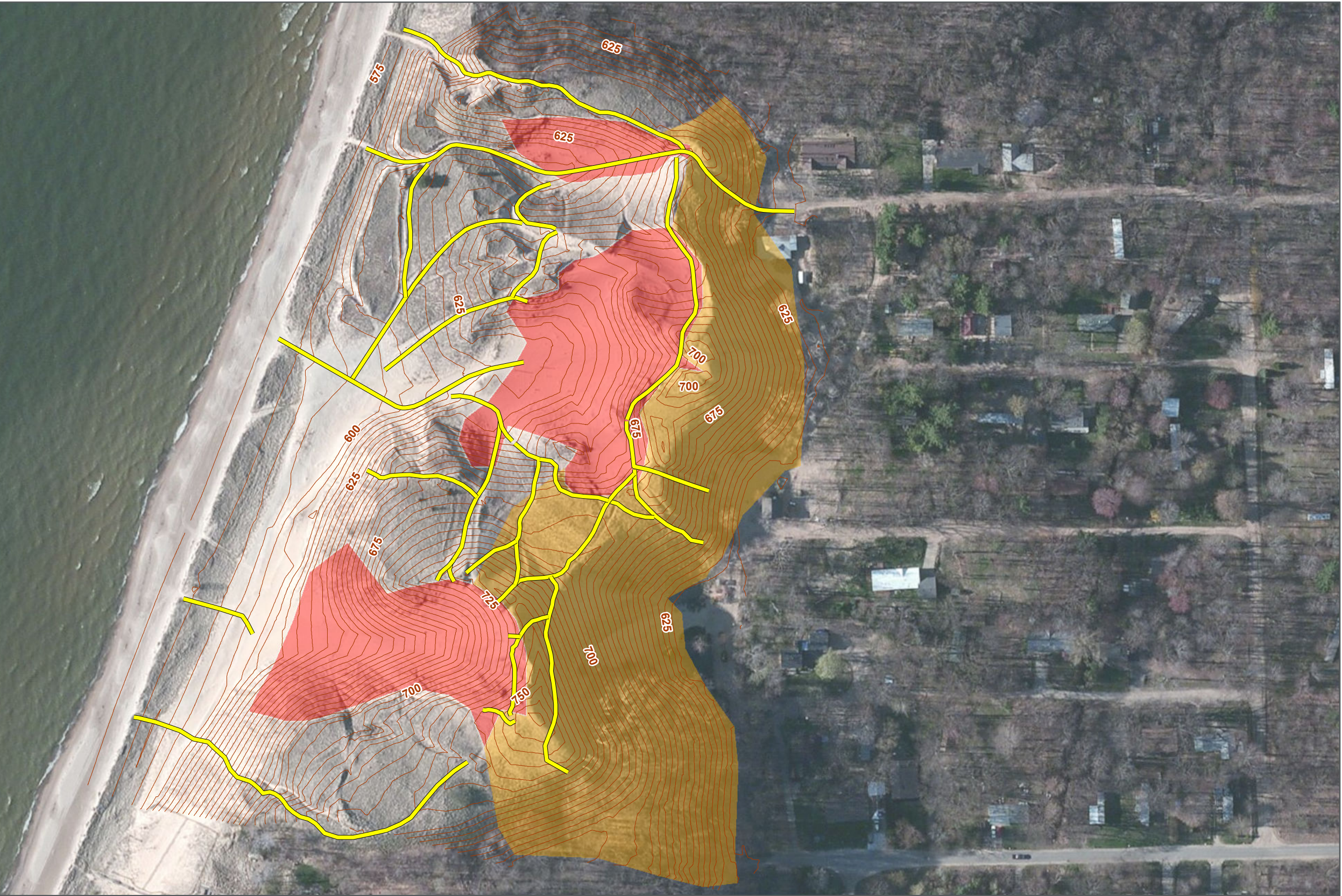
MDEQ 2015. *Sand Dunes Regulatory Guidance*, [http://www.michigan.gov/deg/0,4561,7-135-3311\\_4114\\_4236---,00.html](http://www.michigan.gov/deg/0,4561,7-135-3311_4114_4236---,00.html) Accessed December 16, 2015

Vander Bilt et al. 2013. *Investigation of the Syndicate Park Dune Area*, a report to the Van Buren County Board of Commissioners, Department of Geology, Geography and Environmental Studies, Calvin College, Grand Rapid , MI.



FIGURES





**Legend**

- Blowout Area
- Slipface
- Existing Trails
- Five Foot Contour

Township: 01 S  
Range: 17 W  
Sections: 28, 29, 32, 33  
Project No. J151517400

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**Figure 1: Existing Conditions**  
**Syndicate Dunes Park**  
**Abonmarche**  
**Van Buren County, MI**



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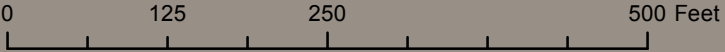
**Legend**

- Proposed Planting Area
- Proposed Woodland Planting Area
- Proposed Fencing
- Maintained ATV Trail
- Maintained Footpath

Township: 01 S  
Range: 17 W  
Sections: 28, 28, 32, 33  
Project No. J151517400

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**Figure 2: Planting Plan**  
Syndicate Dunes Park  
Abonmarche  
Van Buren County, MI



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### Legend

- Blowout Area
- Slipface
- Proposed Fencing
- Five Foot Contour
- Maintained ATV Trail
- Maintained Footpath
- Private Ownership Inholding
- Erosion Monitoring Pins

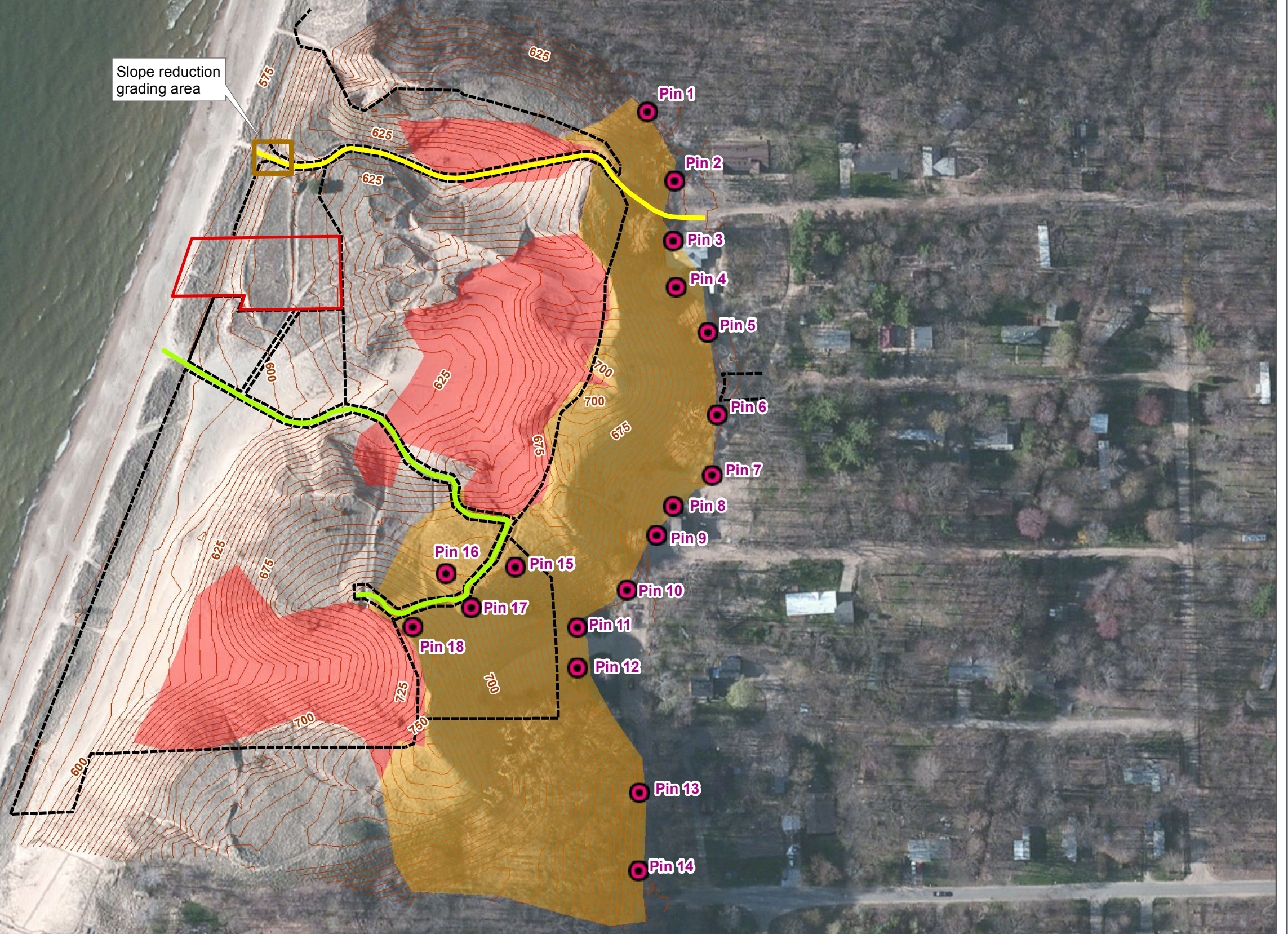


Figure 3: Proposed Conditions  
Syndicate Dunes Park  
Abonmarche  
Van Buren County, MI

0 125 250 500 Feet



Township: 01 S  
Range: 17 W  
Sections: 28, 29, 32, 33  
Project No. J151517400

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Saved By: Rebecca Norris



APPENDIX

A

DUNE ASSESSMENT FORM

## Appendix A. Dune Features Inventory (DFI) Checklist - Activity

### D. Natural Features: Dune Activity

1. Is the dune 100% (or almost entirely) vegetated?

☐ Yes ☐ No

2. Are active blowouts present?

☐ Yes ☐ No

3. Are substantial areas of the dune active?  
(Ex. large blowouts, sand moving over dune crest, etc)

☐ Yes ☐ No

4. Is the dune advancing?

(Evidence of sand deposits reaching bottom of slipface.)

☐ Yes ☐ No

5. Is the dune surface mostly composed of bare sand and early colonizers?

☐ Yes ☐ No

6. Classify dune activity level (see DFI Guide)

- ☐ Inactive/Stable
- ☐ Slightly Active
- ☐ Moderately Active
- ☐ Active
- ☐ Very Active

7. Classify foredune activity (see DFI guide)

☐ Active ☐ Stable

### From the Guide to Completing the DFI: D. Natural Features: Dune Activity

**Active blowouts** have an area of bare sand (the deflation area) which serves as the area of wind erosion. You may also see a downwind area of sand deposition. Bigger or very active blowouts may have a visible slipface; for smaller or less active blowouts, the sand may be deposited on the slopes/vegetation downwind of the blowout.

**Substantial areas of dune activity** include:

- one or more large blowouts (10s of meters in size)
- a large number (>5-10) of small blowouts (<10 m in length or width)
- evidence that sand moves over the crest of the dune: this includes a bare sand area on the (upper) windward slope of the dune, bare sand areas on the dune crest, and a deposition area on the (upper) slipface of the dune
- evidence that sand has moved a significant distance from a sand source: deposition area of blowout(s) extends more than 10 meters from the blowout, fresh deposition on slipface reaches at least half-way down the slope or more.

**Evidence of dune advance** includes fresh sand deposits reaching the bottom of the slipface (ie without leaf litter or soils on the surface of the sand) and/or burial of vegetation/leaf litter/soils at the bottom of the slipface.

Level of Foredune Activity	Responses to Questions 1-5	Description of Dune Characteristics
Active	1. No or Yes 2. No or Yes 3. No or Yes 4. No or Yes 5. Yes	Active foredunes have evidence of sand movement (vegetation burial, fresh sand deposits, leaf/plant litter is buried by sand) and vegetation consists of pioneering species that may not completely cover the dune surface. Scarping of the windward foredune slope is an indicator of recent wave erosion.
Stable (Inactive)	1. Yes 2. No (possibly Yes) 3. No 4. No 5. No	Stable foredunes may have more complete vegetation coverage, less vigorous pioneering species (eg. duller color), greater species diversity from plant succession, and leaf/plant litter on ground beneath active plants. Another dune between the foredune and the beach is often an indicator of stability.

### Classifying Dune Activity for dunes other than foredunes

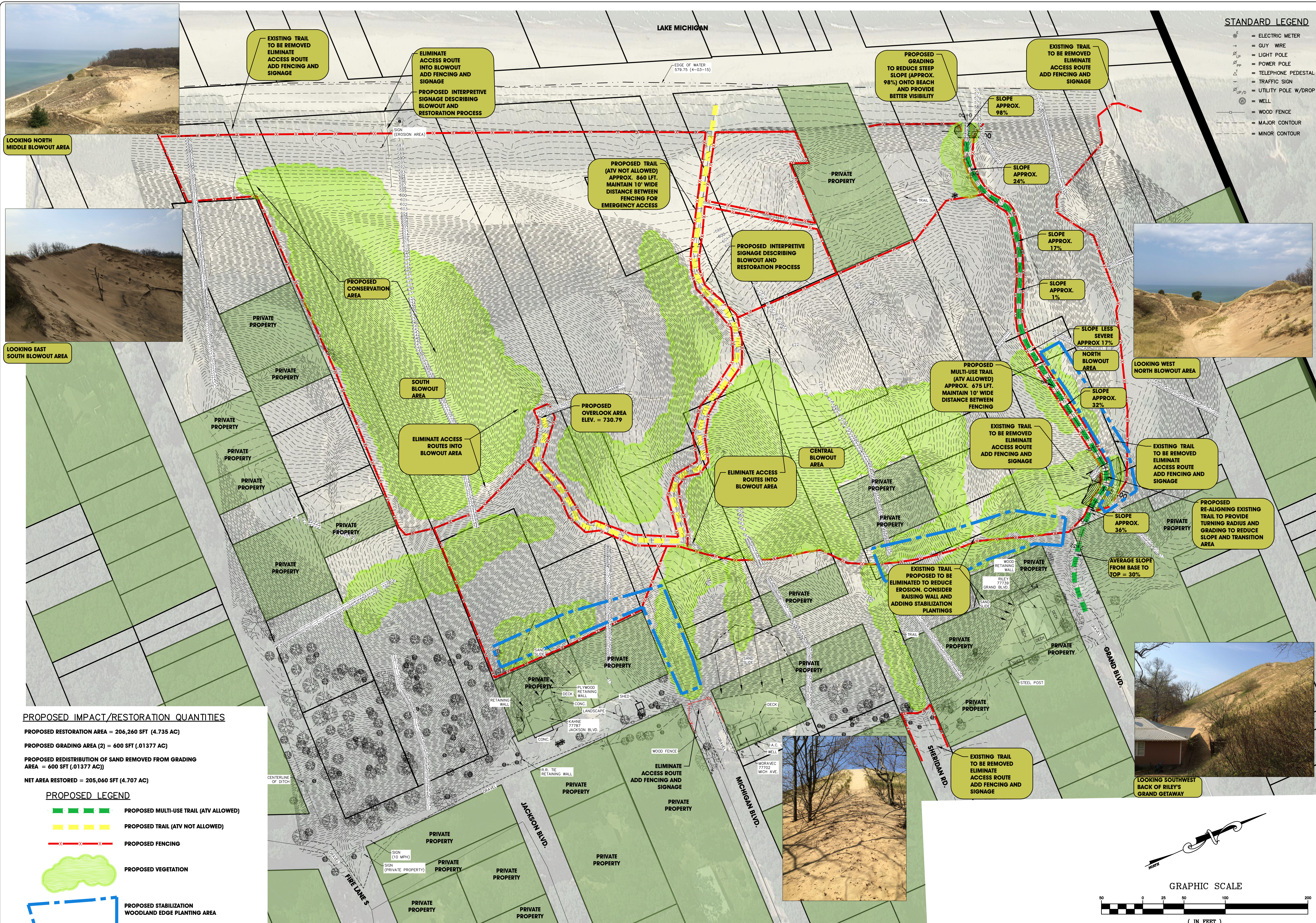
Level of Dune Activity	Responses to Questions 1-5	Description of Dune Characteristics
Inactive (Stable)	1. Yes 2. No 3. No 4. No 5. No	Inactive (stable) dunes are fully vegetated with no locations of sand movement by wind. Dune surfaces have soils and leaf litter on them. Vegetation may be a climax forest community.
Slightly Active	1. No 2. Yes 3. No 4. No 5. No	Slightly active dunes have mostly stable (vegetated) surfaces with localized areas of sand movement. Sand movement occurs from small blowouts with sand deposition occurring within several meters of the blowout.
Moderately Active	1. No 2. Yes 3. Yes 4. No 5. No	Moderately active dunes have stable (vegetated) surfaces with substantial areas of activity in the form of large blowouts and/or sand moving over the crest of the dune. Deposition occurs on the slipface, but sand does not reach the bottom of the slope to cause dune advance. A dune may also be considered moderately active if it contains a very active nested dune on an otherwise stable surface.
Active	1. No 2. Yes 3. Yes 4. Yes 5. No	Active dunes show signs of substantial sand movement (large blowouts, sand moving over the crest of the dune) and the dune is advancing over the underlying landscape (shown by fresh sand deposits reaching the bottom of the slipface). Active dunes often have significant portions of the windward slope with little or no vegetation.
Very Active	1. No 2. Yes 3. Yes 4. Yes 5. Yes	Very active dunes have little or no vegetation and evidence of significant sand movement including significant dune advance. The windward slope and crest of the dune have substantial unvegetated areas for wind erosion and sand transport. The slipface shows many signs of activity (fresh sand deposits reaching the bottom of the slope, burial of vegetation, colonizing species of vegetation). Very active dunes will have rapid advance rates (> 1 m/year).

APPENDIX

# B

ABONMARCHE SITE PLAN 15-0131







APPENDIX

C

MONITORING COSTS

## Annual Monitoring and Maintenance Costs

<b>1<sup>st</sup> Year Monitoring &amp; Maintenance</b>	<b>Estimated Costs</b>
Set Up & Monitoring (Spring - install & GPS 18 wooden stakes) (Summer - determine & GPS baseline photo points, fill out dune assessment form, document any invasive plants and fencing or plant reinstallation needs) (Submit report with recommendations and costs to County)	\$11,000
Plant Warranty and Fencing Reinstallation	\$31,500
Invasive Species Control (if needed)	\$15,000
<b>Total (depending on Invasive Species Control)</b>	<b>\$42,500 - \$57,500</b>

<b>Annual Monitoring &amp; Maintenance (after Year 1)</b>	<b>Estimated Costs</b>
Monitoring (Spring – measure 18 pins and calculate migration) (Summer – fill out dune assessment form, take photos, document any invasive plants or fencing or plant reinstallation needs) (Submit report with recommendations and costs to County)	\$8,000
Annual Plant & Fencing Reinstallation (if needed)	\$25,000
Invasive Species Control (if needed)	\$15,000
<b>Total (depending on amount of planting, fencing and invasive species control)</b>	<b>\$8,000 - \$48,000</b>