REVIEW OF THE 2023 EQUINE FATALITIES AT THE SARATOGA RACE COURSE

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Cover Photograph by Scott E. Palmer

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I. Introduction

Between May 26, 2023 and September 4, 2023, there were 17 equine fatalities at the Saratoga Race Course, which is operated by the New York Racing Association (NYRA). Two of these fatalities occurred prior to the opening of the Saratoga Race Course Meet (Meet) on July 14, 2023, and were not related to exercise. A comprehensive mortality review of all of the 2023 Saratoga equine fatalities was initiated after the unusual occurrence of a cluster (five deaths in five days) of equine fatalities between August 2, 2023 and August 6, 2023. On August 7, 2023, the New York State Gaming Commission (Commission) Equine Medical Director convened a meeting of NYRA regulatory veterinarians, NYRA safety stewards, NYRA racing officials, and the Commission Steward to commence an investigation of this cluster specifically and the number of equine fatalities generally. A second cluster of four exercise-associated equine fatalities occurred between August 23 and August 26, 2023. No fatalities occurred in the four Steeplechase races that were held during this Meet and there were no fatalities on the Oklahoma training track. The 2023 Saratoga Race Meet was conducted during a period of unprecedented inclement weather.

During a public meeting of the Commission on October 3, 2023, Commission Equine Medical Director Dr. Scott Palmer, VMD, A.B.V.P., Equine Practice, presented preliminary findings of this investigation. Palmer noted that the total number of equine fatalities during the 2023 Saratoga Meet was similar or less than that of Meets in the previous five years. However, the number of racing fatalities during the 2023 Meet was three times greater than the number of racing fatalities during the 2022 Meet. Approximately 90 percent of the fatalities were the result of musculoskeletal injury of the fetlock joint, with most of the racing fatalities occurring in the final furlongs or in the gallop-out after crossing the finish line. Five of the six fatalities that occurred on the Main Track happened in the front stretch of the racetrack before the Grandstand.

Following months of analysis of individual horse and collective risk factors, this report is intended to provide additional insight into the circumstances that likely contributed to the racing fatalities during the 2023 Saratoga Meet and to offer recommendations intended to minimize the incidence of equine fatalities going forward.

II. Scope and Report Methodology

This Report summarizes the findings of a comprehensive review of all the equine fatalities that occurred at the 2023 Meet at Saratoga Race Course. Historical information, including medical history, past performances, and workouts of horses that experienced a fatality while training or racing was reviewed. Efforts were made to interview trainers and riders of the injured horses, their attending veterinarians, regulatory veterinarians, the track superintendent, and the stewards. Daily weather, monitoring of the condition of the racing surfaces, and racetrack maintenance records were also considered.

The most obvious environmental variable of the 2023 Saratoga Race Meet was the unprecedented amount of rainfall that occurred during July and August. Although the fact of relentless rainfall was not in dispute, the actual significance of this unusual weather event was among the primary focuses of this review.

***Figure 1**. Unprecedented rainfall during the 2023 Saratoga Race Meet was an obvious environmental factor and a subject of a thorough investigation during this review. (Photo by Skip Dickstein, used with permission).*

Accordingly, this Report seeks to determine if the extraordinary amount of rainfall could have contributed to increased risk for equine exercise-associated fatalities, and if so, how it impacted horses racing at Saratoga. The scientific literature on this subject was reviewed and objective data was obtained to provide an evidence-based assessment of moisture in the racetrack as a potential risk factor for injury.

Non-parametric statistical analysis of the data was performed by Dr. Hussni O. Mohammed, Professor of Epidemiology, Department of Population Medicine, Cornell University College of Veterinary Medicine, using IBM SPSS Software.

III. 2023 in Historical Perspective

In calendar year 2023, Saratoga Race Course experienced 17 equine fatalities, a six percent increase from the average (16.2) of the previous five calendar years. The highest total number of equine fatalities occurred in 2020, likely due to the disruption of horse conditioning during the coronavirus pandemic. Specifically, the lack of a normal training schedule during 2020 adversely affected the normal skeletal development of two-year-old racehorses. In the eight years prior to the 2020 Saratoga Meet, two-year-old horses represented 20 percent of the total number of equine fatalities at the Saratoga Race Course. In 2020, two-year-old horses represented 62 percent of the total number of equine fatalities at Saratoga Race Course.

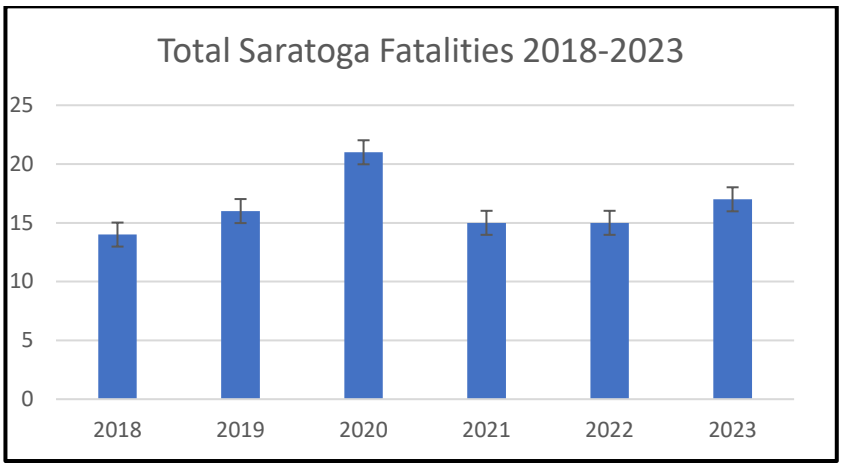

***Figure 2**. Total equine fatalities at Saratoga Race Course 2018-2023.*

The total number of equine fatalities at Saratoga Race Course 2018-2023 also varied from year-to-year, when classified by the activity in which they occurred (racing, training, and other) as seen in **Figure 3** below.

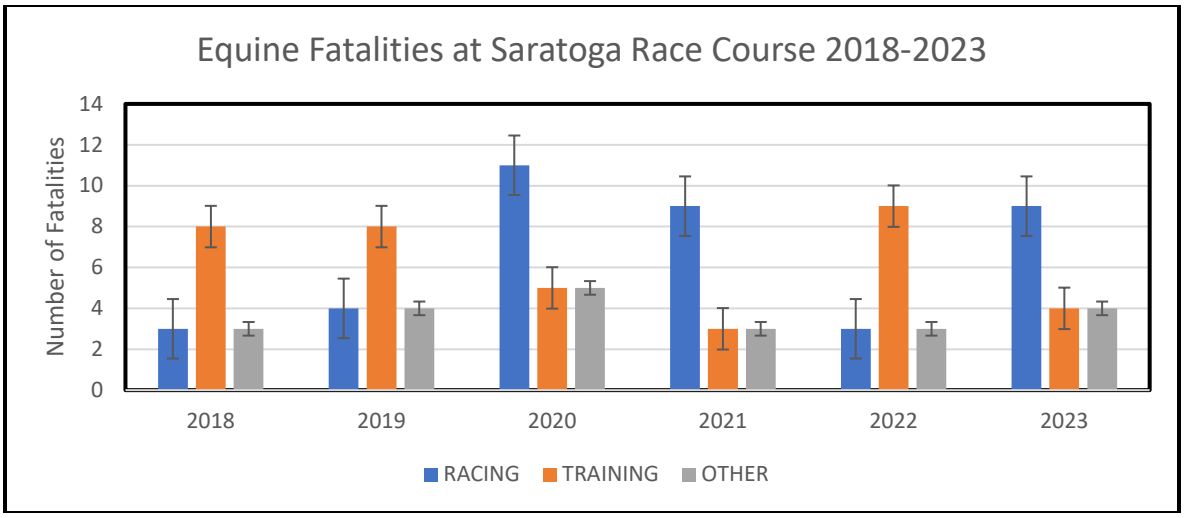

***Figure 3**. Equine fatalities at Saratoga Race Course 2018-2023 sorted by activity.*

The total number of equine fatalities is a metric that does not consider variation in the number of starts or the number of official timed workouts from year-to-year. Racing and training fatality incidence rates are more meaningful for year-to-year comparisons because incident rates represent the number of deaths as a proportion of the number of horses at risk during a specific activity (either racing or training at high speeds). As seen in **Figure 4**, the average incidence rate for racing fatalities at Saratoga Race Course from 2018 through 2022 was 1.56/1,000 starts. The incidence rate for racing fatalities at Saratoga Race Course in 2023 increased to 2.84/1,000 starts. The incidence of training fatalities at Saratoga Race Course from 2018 through 2022 was 0.64/1,000 official timed workouts. In 2023 the incidence of training fatalities was 0.29/1,000 official timed workouts. In summary, the incidence of racing fatalities at Saratoga Race Course in 2023 increased 82 percent above that of the average of the previous five years while the incidence of training fatalities at Saratoga Race Course in 2023 decreased by 55 percent from the average of the previous five years.

This distinction is important. This Report seeks to determine circumstances that may have contributed to the increase in exercise-associated fatalities during the 2023 Saratoga Meet. Given the above, a priority of this review is to focus on circumstances that existed during the time in which races were conducted.

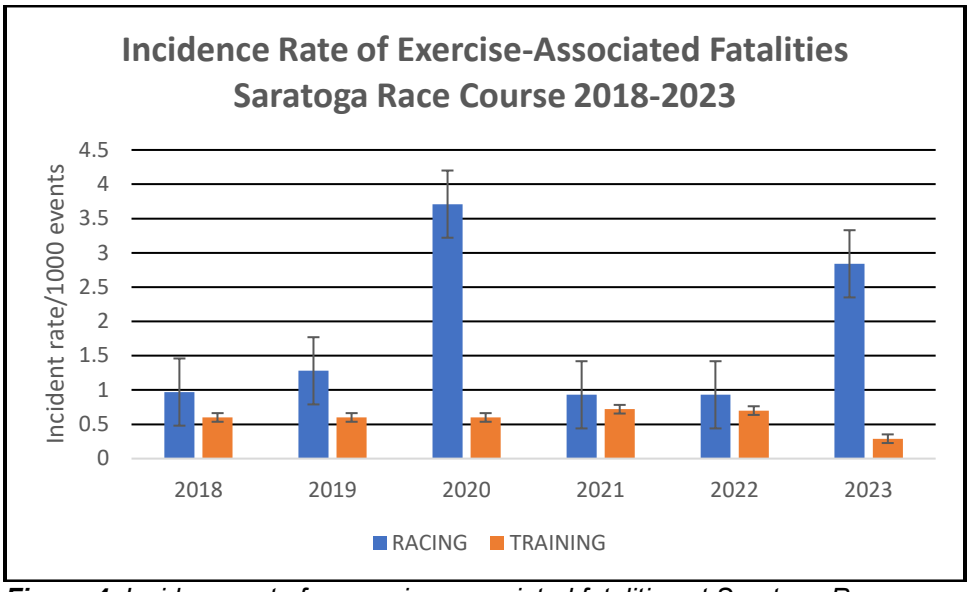

***Figure 4**. Incidence rate for exercise-associated fatalities at Saratoga Race Course from 2018 through 2023 listed as fatalities per 1,000 starts for racing and fatalities per 1,000 official timed workouts for training.*

IV. Overview of the 2023 Saratoga Equine Fatalities

The individual 2023 Saratoga fatalities are listed below in **Table 1**, including the activity and location on the track where exercise-associated incidents occurred. The first two fatalities were not exercise-related and occurred prior to the opening of the Meet.

	Date	Horse	Type	Course	Location
1.	05/26/23	Kaon	Other	Not Applicable	
2.	06/10/23	Ami's Curlin	Other	Not Applicable	
3.	07/15/23	Frigid Lady	Training	Main Track	Past wire
4.	07/20/23	Winter Son	Training	Main Track	1/8 Pole
5.	07/23/23	Blame It On Mary	Racing	Mellon Turf	3/8 Pole
6.	08/02/23	Lawful	Training	Main Track	Undetermined
7.	08/03/23	Sopran Basilea (IRE)	Racing	Inner Turf	Past wire
8.	08/05/23	Maple Leaf Mel	Racing	Main Track	Finish Line
9.	08/06/23	Ever Summer	Racing	Inner Turf	1/4 Pole
10.	08/06/23	Closed Caption	Training	Main Track	5/8 Pole
11.	08/16/23	Wisecraken	Racing	Mellon Turf	5/16 Pole
12.	08/17/23	Art Collector	Other	Not Applicable	
13.	08/23/23	Burning Bright	Racing	Mellon Turf	3/8 Pole
14.	08/25/23	La Aguililla	Racing	Main Track	Past wire
15.	08/26/23	Nobel (IRE)	Racing	Mellon Turf	Past wire
16.	08/26/23	New York Thunder	Racing	Main Track	Finish Line
17.	08/29/23	Shutters	Other	Not Applicable	

***Table 1**. Chronological list of the 17 equine fatalities that occurred at Saratoga Race Couse in 2023*

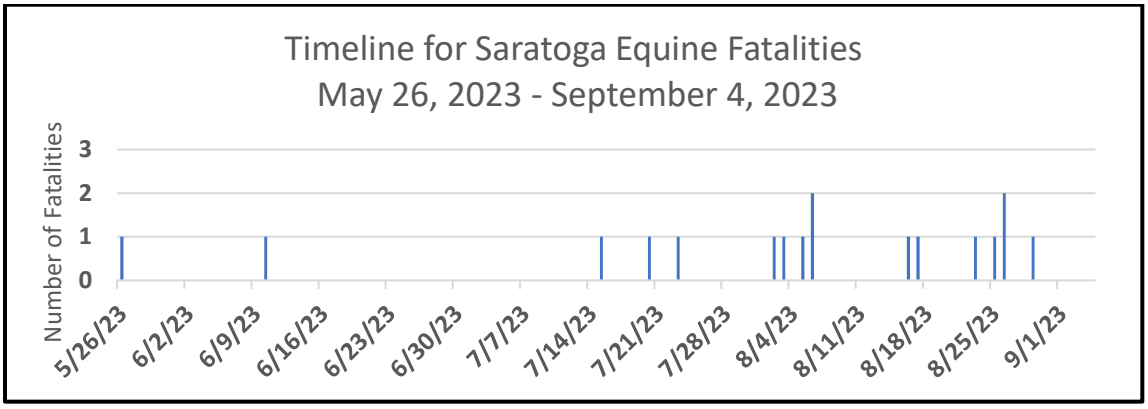

***Figure 5**. Daily timeline for equine fatalities that occurred at Saratoga in 2023. The Race Meet began on July 14, 2023 and concluded on September 4, 2023.*

The Meet began on July 14, 2023, and concluded on September 4, 2023. During the days surrounding the Whitney Stakes (August 2, 2023 – August 6, 2023) five musculoskeletal fatalities occurred within five days. During the days surrounding the Travers Stakes (August 23, 2023 – August 26, 2023) four musculoskeletal fatalities occurred within four days. See **Figure 5**.

During the 2023 Saratoga Meet, there were 13 exercise-associated fatalities. Nine of these fatalities occurred during racing. With a total of 3,172 starts during the Meet, there was a racing fatality incidence rate of 2.84/1,000 starts. Four training fatalities occurred during the Meet, out of a total of 7,363 official timed workouts, resulting in a training fatality incidence rate of 0.54/1,000 official timed workouts.

Exercise-associated equine fatalities during the Meet occurred on the Main Track, which is dirt, and over the two turf courses, the Mellon Turf and the Inner Turf. Seven fatalities occurred on the Main Track, two occurred on the Inner Turf Course, and four occurred on the Mellon Turf Course. Most of the exercise-associated racing fatalities occurred in the final furlongs of the race or when the horses were galloping out after the race. The precise location on the racetrack where exercise-associated fatalities occur is difficult to determine as it often takes time for a jockey or exercise rider to pull up the horse when a gait abnormality is detected. In other cases, the horse may not show lameness until leaving the racetrack. For example, the actual location where Lawful suffered his injury on the Main Track while training is unknown as the horse worked without incident, left the track in good condition, then became lame when he returned to the barn area. See **Figure 6.**

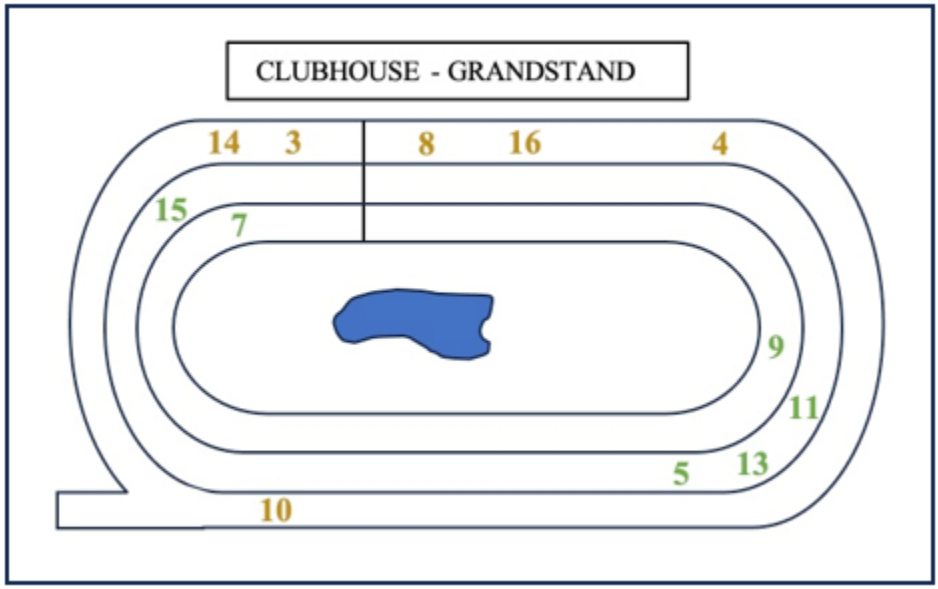

Figure 6*. Approximate location of 12 of the exercise-associated equine fatalities on the Main Track (outside oval), the Mellon Turf course (middle oval) and the Inner Turf course (innermost oval adjacent to the infield) during the 2023 Saratoga Race Meet. The location for one fatality (Lawful - #6) was not determined. The numbers in this figure represent the chronological order in which the fatalities occurred (see* ***Table 1****). Numbers in brown indicate dirt fatalities. Numbers in green represent turf fatalities.*

V. Equine Fatalities by the Numbers

A. Exercise Associated Fatalities

Thirteen horses experienced exercise-associated fatalities during the Meet. Of these, seven were females, two were colts and four were geldings. By age: Six horses were three-year-olds, three were four-year-olds, two were five-year-olds, one was a six-year-old, and one was a seven-year-old. No two-year-old horses experienced an exercise-associated fatality during the Meet.

Of the 12 horses that experienced exercise-associated fatal musculoskeletal injuries (FMSI), 11 horses, or 92 percent, experienced fatal hyper-extension injuries of the fetlock joint. The other experienced a fatal mid-shaft cannon bone fracture.

Four exercise associated fatalities occurred while training and nine occurred during racing.

One horse experienced exercise-associated sudden death (EASD) during a race, unrelated to musculoskeletal injury.

B. Dirt vs Turf Fatalities

Of the eight racing FMSI fatalities, five occurred on turf while three occurred on dirt.

Seven of the 13 exercise-associated fatalities (12 FMSI, 1 EASD) occurred on the Main Track, while six occurred on the turf, with two on the Inner Turf and four on the Mellon Turf.

Seven of the 12 exercise-associated FMSI occurred on the Main Track, and five occurred on the turf.

C. Other Fatalities

Four fatalities occurred in the barn area and were not associated with exercise.

D. Racing vs Training Fatalities

The number of *racing* fatalities in 2023 (9) was three times higher than the number of *racing* fatalities in 2022 (3).

The number of training fatalities in 2023 (4) was less than half the number of training fatalities in 2022 (9).

All the training FMSI occurred on the Main Track.

The incidence of *racing* fatalities during the Meet was 2.84/1,000 starts.

The incidence of *training* fatalities during the Meet was 0.54/1,000 official timed workouts.

E. Fatality Clusters

Five (42 percent) of the 12 FMSI occurred within a five-day period between August 2, 2023 and August 6, 2023, while three others (25 percent) occurred within a two-day period between August 25, 2023 and August 26, 2023.

On three occasions, FMSI occurred on consecutive days: August 2 and August 3, 2023, August 5 and 6, 2023, and August 25 and 26, 2023.

On two occasions, two FMSI occurred on the same day: August 6, 2023 and August 26, 2023.

F. Race Surface Conditions

Of the five racing FMSI that occurred on the turf, two occurred on a firm track and three occurred on a good track. Of the three racing FMSI that occurred on the dirt, one occurred on a fast surface and two occurred on a muddy/sealed surface.

G. Timing

Eight of 12 (67 percent) exercise associated FMSI occurred in two separate clusters as represented by the red boxes in **Figure 7**. There were four FMSI within a five-day period the week of the Whitney Stakes and three FMSI in the two days of the Travers Stakes weekend.

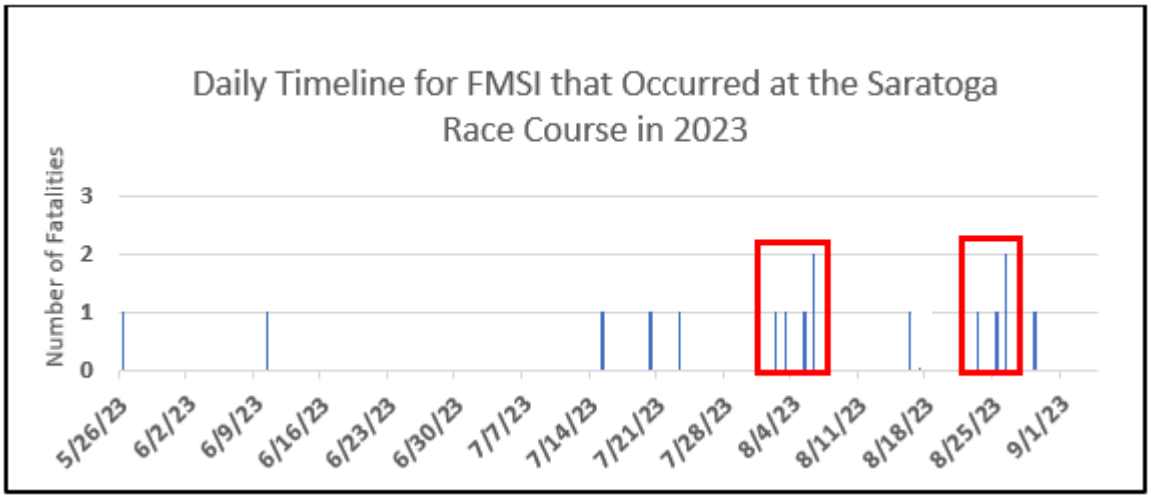

***Figure 7**. Daily timeline for the 12 exercise-associated FMSI that occurred at Saratoga in 2023. The red boxes indicate the timeframe of the two clusters of FMSI during the 2023 Saratoga Race Meet.*

The 12 exercise-associated FMSI were distributed among eight weekly time periods of the 2023 Saratoga Race Meet. Horses experienced FMSI in all but two weeks of the Meet. The highest number of FMSI occurred in week four and week seven. There were no FMSI in week six and week eight.

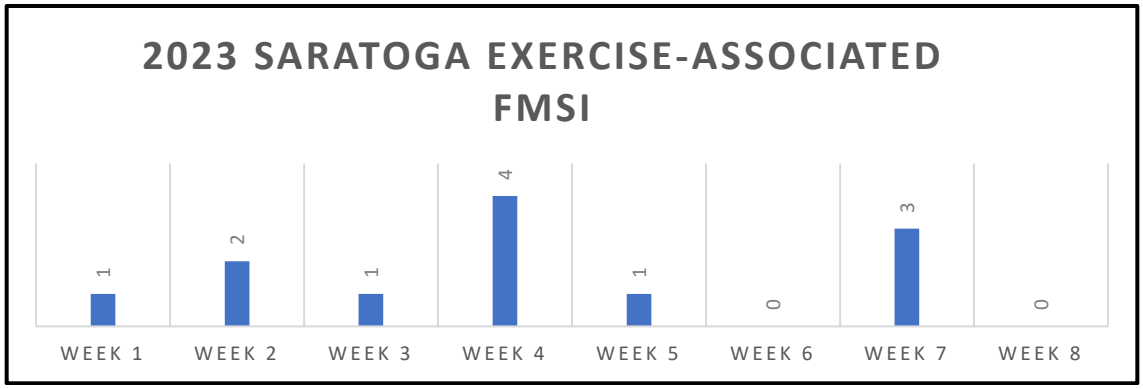

***Figure 8**. Weekly distribution for the 12 exercise-associated fatal musculoskeletal injuries (FMSI) that occurred at the 2023 Saratoga Meet. There were no FMSI during weeks six & eight.*

H. Race Type

One fatality (La Aguililla) occurred in a claiming race. Three fatalities (Blame It On Mary, Ever Summer, and Nobel (IRE)) occurred in Allowance Optional Claiming races. Four fatalities (Sopran Basilea (IRE), Maple Leaf Mel, Burning Bright, and New York Thunder) occurred in Stakes races.

I. Miscellanea

The inside rail was set at 18 feet for both racing fatalities that occurred on the Inner Turf Course.

For the four racing fatalities that occurred on the Mellon Turf Course: One occurred with the temporary rail set at 27 feet, one other occurred with the temporary rail removed, and the other two occurred with the temporary rail set at 12 feet.

No catastrophic incidents occurred on either the dirt or turf Oklahoma training tracks.

Two of the 17 fatalities were trained by the same trainer.

Five of the 12 horses that experienced FMSI (42 percent) shipped from other racing jurisdictions and did not train at Saratoga prior to their fatal musculoskeletal injury.

No fatalities occurred during the four Steeplechase races conducted during the Meet, which had 33 individual starters.

Ten of the fatalities had the experience of being on the Veterinarian's List (see **Table 2**). One horse that experienced a training fatality at Saratoga was on the Kentucky Veterinarian's List for unsoundness at the time of the Saratoga injury.

One horse that experienced a racing fatality at Saratoga had previously been placed on the New York Veterinarian's List for injury prior to shipping to Saratoga.

Eight additional horses that experienced exercise-associated fatalities had been on the Veterinarian's List for reasons other than unsoundness or injury prior to racing at Saratoga.

Horse	Date	Location	Reason
Frigid Lady	06/20/23	Ellis Park	Intra-articular injection
	03/04/23	Keeneland	Intra-articular injection
	01/02/23	Keeneland	Intra-articular injection
Winter Son	01/19/23	Aqueduct	State List - other
Blame It On Mary	05/18/23	Belmont Park	State List - other
Sopran Basilea (IRE)	04/26/23	Laurel Park	State List - Recency
Maple Leaf Mel	07/05/22	Belmont Park	Intra-articular injection
Ever Summer	11/18/22	Aqueduct	DNF
	08/24/22	Delaware Park	Recency
Closed Caption	04/07/23	Keeneland	State List - Unsoundness
	07/22/23	Keeneland	State List – Intra-articular injection
Wisecraken	06/27/23	Belmont	Recency
La Aguililla	06/02/23	Belmont Park	State List - Sick
New York Thunder	06/10/23	Belmont Park	Injured
	06/11/23	Gulfstream Park	Intra-articular injection
	07/14/23	Monmouth Park	Intra-articular injection
	08/12/23	Monmouth Park	Intra-articular injection

***Table 2**. Ten horses that experienced exercise-associated fatalities during the 2023 Saratoga Race Meet were on the Veterinarian's List at some point in their career prior to racing at Saratoga.*

VI. High-Speed Exercise

The high-speed exercise of a Thoroughbred race horse is exercise undertaken at or close to racing speed. During training, this exercise is documented by the racetrack as an “Official Timed Workout.” The distance traveled during these workouts is measured in furlongs (1/8 of a mile). The distance traveled during high-speed exercise, whether racing or training, stimulates the skeleton to adapt to the high-speed workload. Over time and with appropriate rest between high-speed workouts, the horse’s skeleton becomes stronger by adding and modeling new bone. The number of high-speed furlongs accumulated during a horse’s career provides a useful metric to measure the intensity of exercise experienced by the horse.

By comparing the total amount and rate of accumulation of high-speed furlongs from time to time during a horse’s career, changes or trends in exercise intensity become apparent. Just as a car’s odometer measures the distance traveled by that car over time, high-speed exercise records provide an indication of the intensity of workload over time. Horses that accumulate very high exercise loads during their career or horses that experience a significant increase in workload that differs from that to which the horse has adapted are at increased risk for repetitive cyclic injury.

In addition to simply measuring the distance traveled at speed and the rate of accumulation of that workload, another metric used to quantify exercise intensity of Thoroughbred racehorses is calculation of the ratio of work weeks to rest weeks throughout a horse’s racing career. A work week is a week in which a horse races or completes an official timed workout. A rest week is a week in which no high-speed exercise is completed. This metric is calculated by dividing the number of weeks in which a horse either races or completes an official timed workout by the number of weeks in which a horse does not race or completes an official timed workout during a fixed period of time. This metric allows for a comparison of one segment of a horse’s career to another. In this report, the total career work week-to-rest week ratios of horses that experienced FMSI were compared to that of the 12-week period leading up to the incident event. Both of these metrics were used to quantify the exercise intensity of the 12 horses that experienced exercise-associated FMSI during the 2023 Saratoga Race Meet.

VII. Individual Horse Analysis

1. KAON, Fatality Classification: Other

Incident: On May 26, 2023, Kaon, a three-year-old bay colt, trained by Mr. Chad Brown and owned by Calumet Farm, was euthanized following unsuccessful treatment of a neurologic disorder.

Exercise Summary: Not applicable

Risk factors for fatal musculoskeletal injury: Not applicable

Drug test results: Not applicable

Trainer Narrative: Not applicable

Rider Narrative: Not applicable

Veterinary Narrative: Hospital Discharge Record, Dr. Sarah Thomas, Attending Veterinarian at the Rood and Riddle Equine Hospital: Kaon was presented to the Rood and Riddle Equine Hospital for evaluation of acute onset of neurologic signs. On admission, he was leaning against the wall with his body turned to the right in the horse trailer. He had facial muscle deviation, was reactive to stimulation and became violently reactive to attempts to move him. He was given a short-acting anesthetic to glide him off the trainer. Radiographs of his head and neck were within normal limits. Despite aggressive medical therapy his condition worsened. He was humanely euthanized due to a rapid decline in his clinical signs and a lack of response to therapy.

Necropsy Findings: Significant necropsy examination findings included a severe inflammation of the brainstem and sections of the cervical spinal cord, accounting for the neurologic signs seen in this horse. The degree and pattern of the inflammation is consistent with equine protozoal myeloencephalitis (EPM).

Conclusion: This was a non-exercise associated fatality caused by a neurological disease (likely Equine Protozoal Myeloencephalitis).

2. AMI'S CURLIN, Fatality Classification: Other

Incident: On June 10, 2023, Ami's Curlin, a two-year-old chestnut colt, trained by Mr. Christophe Clement and owned by Tall Oaks Farm was euthanized following unsuccessful treatment of severe colitis that led to laminitis.

Exercise Summary: Not applicable

Risk factors for fatal musculoskeletal injury: Not applicable

Drug test results: Not applicable

Trainer Narrative: Not applicable

Rider Narrative: Not applicable

Veterinary Narrative: Statement by Dr. Sarah Thomas**:** Ami's Curlin was presented to the Rood & Riddle Equine Hospital for treatment of acute onset diarrhea. The clinical diagnosis was colitis, for which he was treated with appropriate medical therapy. After 12 days of treatment, his condition deteriorated. He developed laminitis in all four limbs and was euthanized.

Necropsy Findings: Significant necropsy findings included retropharyngeal and mandibular lymph node abscessation, mycotic pneumonia, and ulcerative cystitis. Numerous colonies of gram-positive coccoid bacteria present in the lymph nodes are consistent with *Streptococcus equi* infection. This infection likely spread to the lungs. The clinical significance of the ulcerative cystitis was unclear.

Conclusion: This was a non-exercise associated fatality caused by a bacterial infection, leading to septicemia and laminitis.

3. FRIGID LADY, Fatality Classification: Training

Incident: On July 15, 2023, Frigid Lady, a three-year-old chestnut filly, trained by Mr. Michael J. Maker and owned by Chase 'n Dreams Stable, experienced a biaxial proximal sesamoid bone fracture of her right forelimb at the mile pole while breezing on the Main Track. The weather was clear and the track condition at the time of the incident was rated as fast. She was examined by Attending Veterinarian Dr. Ray Oke, who performed humane euthanasia due to the severity of the injury and a poor prognosis for recovery.

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	11	2	3	2	$ 156,687
2023	5	1	1	0	$ 69,215
2022	6	1	2	2	$ 87,472

Frigid Lady's racing career spanned two years. She made her first three starts as a two-year-old for Trainer Mr. Steve Asmussen, was claimed by Mr. Maker on September 18, 2022, and made three additional starts in 2022. She made five starts as a three-year-old prior to the incident workout. The incident workout followed her 11th career start. The intervals between her last three races were 27, 21 and 30 days. Her last three races leading up to the incident workout were in Starter Allowance races (50000nw1/x class). The career work week-to-rest week ratio for this filly was 1.27 (slightly more work than rest is normal). The work week-to-rest ratio for the final 12 weeks of this horse's career was 0.63. This means that although Frigid Lady's career high-speed exercise intensity level increased steadily without any significant layups of more than 30 days, her exercise intensity for the 12 weeks leading up to the incident race was approximately half that of the average work intensity throughout her career.

Risk Factors for fatal musculoskeletal injury:

- Racing on a dirt racetrack
- Previously on Veterinarian's List (June 20, 2023 - Intra-articular injection)

Drug test results: The Commission has not been advised by Horseracing Integrity and Welfare Unit (HIWU) of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: This filly was claimed by her current trainer on September 18, 2022. She was in fine clinical condition at that time. No medications were administered to this filly prior to breezing. This filly did not miss training due to illness or soreness. She did not have surgery of any kind. The exercise rider, groom or jockey never advised the trainer of any unsoundness. This filly did not have any problems changing leads. Frigid Lady was last examined by a veterinarian in Kentucky prior to breezing and prior to entry for racing.

Radiographs of this filly were clean. The front ankles of this filly were injected in April and June. She did not leave the grounds of the racetrack while under his care. No pre-breeze medications were administered to this filly. The trainer's impression of the racetrack at the time of the incident workout was that it was fine.

Rider Narrative: No significant observations were reported by the exercise rider.

Veterinarian Narrative: A statement was not obtained.

Necropsy Summary: Significant necropsy findings of the left forelimb included moderate subchondral bone sclerosis of the third carpal bone, mild axial score lines of the proximal sesamoid bones, biaxial grade 1 palmar osteochondral disease and moderate score lines of the distal articular surface of the cannon bone, mild dorsal extensor process arthropathy with moderate score lines of the articular cartilage of the proximal phalanx. In the right forelimb there was focal cartilage erosion and degeneration of the distal radius and the dorsal aspect of the intermediate carpal bone. There was severe subchondral bone sclerosis of the third carpal bone. In the fetlock joint there was a biaxial fracture of the base of both proximal sesamoid bones, complete rupture of the intersesamoidian ligament, partial rupture of the superficial and deep digital flexor tendons. There was extensive traumatic cartilage disruption of the distal articular surface of the cannon bone and grade 1 palmar osteochondral disease with moderate score lines of the cartilage. There was also moderate dorsal extensor process arthropathy with focal cartilage ulceration and moderate score lines of the articular surface of the proximal phalanx.

Conclusion: This was an exercise-associated training fatality caused by a musculoskelal injury of the right front fetlock. There was evidence of pre-existing musculoskeletal pathology in the left and right forelimbs of this horse. In addition to the risk factors listed above, the presence of pre-existing musculoskeletal pathology and a sustained accumulation of high-speed exercise throughout the 15 months of her racing career likely contributed to increased risk for FMSI.

4. WINTER SON, Fatality Classification: Training

Incident: On July 20, 2023, Winter Son, a four-year-old chestnut gelding, trained by Mr. Marcello Arenas and owned by Salvatore Giangrande, Marcelo Arenas, Stefano Giangrande, and Edward Hardt, experienced a compound, comminuted fracture of the right front medial proximal sesamoid bone while breezing at the 1/8-mile pole on the Main Track. The weather was clear, and the track was rated as fast. He was attended by Dr. Oke, who administered humane euthanasia due the severity of the injury and a poor prognosis for recovery.

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	15	2	2	1	$83,814
2023	4	0	0	0	$5,680
2022	7	1	1	1	$61,310
2021	4	1	1	0	$16,824

Winter Son's racing career spanned three years. He raced four times as a two-year-old, seven times as a three-year-old, and four times as a four-year-old prior to the incident race. This training incident followed his 15th career start. The intervals between his last three races were 50 days, 23 days, and 18 days. His last three races were Allowance races nw1/x with purses ranging from $95,000 to $57,500. Winter's Son was claimed by Mr. Arenas from Mr. James Chapman on April 10, 2022. His average career work week-to-rest week ratio was 0.6 and the work week-to-rest week ratio for the final 12 weeks of his career was 1.0. He had a 20-week layup in 2021 and a 22-week layup in 2022. This means that Winter Son's high-speed exercise intensity for the 12 weeks leading up to the incident workout was approximately twice that of the total average work intensity throughout his career. Two extended layup periods are unusual and account for the low career work week-to-rest week ratio in this horse.

Risk Factors for fatal musculoskeletal injury:

- Male horse
- Repeated lay-ups of more than 60 days
- Previously on the Veterinarian's List (January 19, 2023 – State List Other)
- Races less than seven furlongs
- Change in race frequency

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: Trainer Arenas acquired Winter Son on April 10, 2024. He was in good condition at that time. No medication was administered to this horse

prior to breezing. This horse did miss training due to illness. He never had surgery of any kind. The exercise rider, groom or jockey never advised Arenas of any unsoundness of this horse. He did not have any problems changing leads. He never left the grounds of the racetrack while under the care of Arenas. It appeared that he was injured while changing leads. The trainer opined that the racetrack was normal.

Rider Narrative: A statement was not obtained.

Veterinary Narrative: A statement was not obtained.

Necropsy Findings: Significant necropsy findings of the left forelimb included moderate subchondral bone sclerosis and mild, locally extensive cartilage erosion of the third carpal bone. There were biaxial cartilage creases at the base of the mid-sagittal ridge of the cannon bone. There was mild to moderate dorsal extensor process arthropathy and mild score lines present on the dorsal articular cartilage of the proximal phalanx. In the right forelimb there was an open, comminuted, displaced lateral condylar fracture of the cannon bone with locally extensive, acute traumatic cartilage ulceration. There was also an abaxial avulsion fracture of the medial proximal sesamoid bone and a comminuted basilar fracture of the lateral proximal sesamoid bone. There was a complete rupture of the intersesamoidian ligament and a laceration with fraying of the deep digital flexor tendon. There was multifocal acute traumatic cartilage ulceration and mild to moderate dorsal extensor process arthropathy with mild score lines of the articular surface of the proximal phalanx.

Conclusion: This was an exercise-associated training fatality caused by a musculoskeletal injury of the right front fetlock. There was evidence of pre-existing bone pathology in the left and right forelimbs of this horse. In addition to the risk factors listed above, the presence of pre-existing bone pathology and a relatively rapid accumulation of high-speed exercise during the final 12 weeks leading up to the incident workout likely contributed to increased risk for FMSI.

5. BLAME IT ON MARY, Fatality Classification: Racing

Incident: On July 23, 2023, Blame It On Mary, a five-year-old bay mare, trained by Mr. Edward Barker and owned by J and M Racing Stables, experienced a comminuted biaxial proximal sesamoid bone fracture of the left forelimb during the third race, a 5 1/2-furlong Allowance Optional Claiming race (SNW2$x) on the Mellon Turf Course. The mare was not, however, in for claim. The jockey was Mr. Luis Saez. The weather was clear, and the track was rated as firm. The race was off at 2:27PM. Blame It On Mary was competitive coming out of the starting gate and appeared to be galloping normally until Saez pulled her up and took her to the outside rail at the 3/8 pole.

Chart notations included the following comments:

> "BLAME IT ON MARY established the front and showed the way in hand three then two wide down the backstretch, was injured just inside the seven-sixteenths and lost action and was immediately placed to a firm protective hold and expertly pulled up in the two-path backing up through the field and then guided outside to a stop near the five-sixteenths and was subsequently vanned off."

Blame It On Mary was ambulanced to the barn and attended to by Attending Veterinarian Dr. Keith Bogatch. She was humanely euthanized due to the severity of the injury and a poor prognosis for recovery.

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	23	2	4	4	$ 213,954
2023	2	0	0	1	$ 10,200
2022	9	1	2	0	$ 87,631
2021	8	1	2	1	$ 82,920
2020	4	0	0	2	$ 33,203

Blame It On Mary's racing career spanned four years. She accumulated 36 high-speed furlongs prior to her first start. She accumulated 382 high-speed furlongs during her entire racing career. Her average career work week-to-rest week ratio was 0.77, meaning she rested slightly more than she worked at high-speed. In the 12 weeks prior to the incident race the work week-to-rest week ratio increased to 2.0, meaning that during the final 12 weeks of her career she performed high speed exercise at twice the rate of the average work intensity throughout her career.

Risk Factors for fatal musculoskeletal injury:

- Races less than seven furlongs
- Change in race frequency

- Veterinarian's List (May 18, 2023 – Greater than 180-day layoff)

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: A statement was not obtained.

Rider Narrative: A statement was not obtained.

Veterinary Narrative: A statement was not obtained.

Necropsy Findings: The medial and lateral heels of both front aluminum racing plates had been removed. While this is an unusual method of shoeing, it does not by itself indicate pre-existing injury of the front feet. In the left forelimb there was severe subchondral bone sclerosis of the third carpal bone. There was a complete transverse apical fracture of the medial proximal sesamoid bone and a complete transverse basilar fracture of the lateral proximal sesamoid bone. There was also complete rupture of the inter-sesamoidea ligament. There was extensive fraying of the deep digital flexor tendon at the level of the proximal sesamoid bones and a partial rupture of the superficial digital flexor tendon. A locally extensive acute traumatic cartilage ulceration and mild to moderate score lines of the midsagittal ridge of the cannon bone were also noted, along with a grade 1 palmar osteochondral disease on the lateral condyle of the cannon bone. There was also moderate extensor process arthropathy with locally extensive cartilage ulceration and mild score lines of the proximal articular surface of the proximal phalanx. The right forelimb also had focal mild cartilage erosion on the distal aspect of the radius and the radial carpal bone, and there was moderate dorsal extensor process arthropathy with locally extensive cartilage ulceration with multifocal cartilage defects and moderate score lines in the articular surface of the proximal phalanx.

Conclusion: This was an exercise-associated racing fatality caused by a musculoskeletal injury of the left front fetlock. There was evidence of pre-existing musculoskeletal pathology in the left and right forelimbs of this mare. In addition to the risk factors listed above, the presence of pre-existing musculoskeletal pathology and a relatively rapid accumulation of high-speed exercise during the final 12 weeks leading up to the incident workout likely contributed to increased risk for FMSI.

6. LAWFUL, Fatality Classification: Training

Incident: On August 2, 2023, Lawful, three-year-old chestnut colt, trained and owned by Mr. David Jacobson, experienced a biaxial proximal sesamoid bone fracture of the left forelimb at an undetermined location on the Main Track while breezing 3/8 mile. The weather was clear, and the track was rated as fast. Lawful walked back to the barn and was observed to be lame by NYRA veterinarians. He was radiographed by Attending Veterinarian Dr. Ashley Hamilton and humane euthanasia was performed due to the severity of the injury and a poor prognosis for recovery.

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	7	0	0	4	$ 31,190
2023	6	0	0	3	$ 24,790
2022	1	0	0	1	$ 6,400

Lawful's racing career spanned two years. He accumulated 29 high-speed furlongs prior to his first start. He accumulated a total of 128 high-speed furlongs during his racing career. He raced once in 2022 and six times in 2023. His average career work week-to-rest week ratio was 1.47, meaning he performed high-speed exercise slightly more than he rested. This is normal for a Thoroughbred racehorse. In the 12 weeks leading up to the incident race, his work week-to-rest week ratio was 5.0. This means that there was a significant increase in work intensity in the three-month period leading up to the incident workout.

Risk Factors for fatal musculoskeletal injury:

- Male horse
- Racing on a dirt racetrack
- Change in race frequency

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: A statement was not obtained.

Rider Narrative: A statement was not obtained.

Veterinary Narrative: A statement was not obtained.

Necropsy Findings: Significant necropsy findings for Lawful revealed complete mid-body fractures of both the medial and lateral proximal sesamoid bones of the

left front fetlock joint. There was also tearing of the deep digital flexor tendon at the level of the proximal sesamoid bones.

Conclusion: This was an exercise-associated training fatality caused by a musculoskeletal injury of the left front fetlock. In addition to the risk factors listed above, the increase in exercise intensity leading up to the incident race (more than three times that of his average career work intensity) likely contributed to increased risk for FMSI.

7. SOPRAN BASILEA (IRE), Fatality Classification: Racing

Incident: On August 3, 2023, Sopran Basilea (IRE), a five-year-old chestnut mare, trained by Mr. Graham Motion and owned by Madaket Stables, LLC, experienced a fracture of her right front lateral proximal sesamoid bone in conjunction with a rupture of the distal sesamoidea ligament and the suspensory ligament past the wire, while competing in the 1 1/2-mile G2 Glens Falls Stakes on the Inner Turf Course. The jockey was Mr. Manuel Franco. The weather was clear, and the track was rated as firm. The race was off at 5:45PM. Sopran Basilea (IRE) was not observed to have any gait abnormalities during the race and appeared to have suffered the injury on the gallop-out. She was attended by NYRA Regulatory Veterinarian, Dr. Sarah Hinchcliffe and was humanely euthanized due to the severity of the injury and a poor prognosis for recovery. Chart notations included the following comments:

> "SOPRAN BASILEA (IRE) was reserved in the two path while given cover, was asked four wide on the final turn, chased under a drive in the stretch and just missed the show then suffered an injury on the gallop-out and was euthanized on the course."

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	18	6	6	1	$ 527,145
2023	3	1	1	0	$ 185,000
2022	7	1	3	0	$ 99,368
2021	8	4	2	1	$ 242,777

Sopran Basilea (IRE) raced three years, starting eighteen times. She raced eight times as a two-year-old, seven times as a three-year-old, and three times as a four-year-old. The intervals between her last three races were 203 days, 53 days, and 22 days, with all three being graded stakes races with purses ranging from $100,000 to $250,000. Sopran Basilea (IRE) had a career work week-to-rest week ratio of 0.33, which is low, but likely due to training in Europe during 2021 and 2022. Official timed workouts are not recorded in Europe as they are in the United States. In the 12 weeks leading up to the incident race, her work week-to-rest week ratio was 1.0, less than most Thoroughbred racehorses.

Risk Factors for fatal musculoskeletal injury:

- Older horses at their first start (three-year-old and older)
- Repeated lay-ups of more than 60 days prior to incident
- Previously on Veterinarian's List (April 26, 2023 – Recency)
- Change in racing frequency

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: Trainer Motion indicated that horse had not missed any training due to illness or soreness. Nor had she experienced surgery of any kind. Motion further indicated neither the exercise rider, groom or jockey had ever advised him of unsoundness. No joint injections were performed on this mare, and she had not left grounds while under his care. Motion thought that the turf was very soft on the day of the incident race.

Jockey Narrative: Franco rode this horse for the first time on the day of the incident race. He offered no significant findings during the interview.

Veterinary Narrative: A statement was not obtained.

Necropsy Findings: Significant necropsy examination findings for Sopran Basilea (IRE) included a complete, comminuted fracture of the proximal phalanx in the right front fetlock joint. There was also a rupture of both the suspensory ligament and the distal sesamoidean ligaments. There were no significant abnormalities found in the left front limb.

Conclusion: This was an exercise-associated racing fatality caused by a musculoskeletal injury of the right front fetlock. The risk factors listed above likely contributed to increased risk for FMSI.

8. MAPLE LEAF MEL, Fatality Classification: Racing

Incident:. On August 5, 2023, Maple Leaf Mel, a three-year-old gray or roan filly, trained by Ms. Melanie Giddings and owned by August Dawn Farm, fell just before the wire while competing in the seven-furlong G1 Test Stakes Race on the Main Track. The jockey was Mr. Joel Rosario. The weather was clear, and the track was rated as fast. The race was off at 4:29PM. Maple Leaf Mel experienced a bilateral proximal sesamoid bone fracture with disarticulation of the right front metacarpophalangeal (fetlock) joint. She appeared to be accelerating through the top of the stretch and Rosario indicated that he was unaware of any gait abnormality prior to her collapse. Maple Leaf Mel was attended by Dr. Hinchliffe and was humanely euthanized due to the severity of the injury and a poor prognosis for recovery. Chart notations included the following comments:

> "MAPLE LEAF MEL established the front from the get go and showed the way in hand three then two wide, remained patiently handled through the turn under some pressure from MUNNYS GOLD to the outside, continued two to three wide into upper stretch and was roused straightened away, edged clear to the eighth pole, remained clear inside the final sixteenth and was geared down inside the final seventy yards when suffering a catastrophic injury to the right front leg, fell in the shadow of the wire and was subsequently euthanized on track."

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	6	5	0	0	$ 399,650
2023	4	3	0	0	$ 241,250
2022	2	2	0	0	$ 158,400

Maple Leaf Mel's racing career spanned two years, running twice as a two-year-old and four times as a three-year-old. She accumulated 30 high-speed furlongs prior to her first start in August of 2022. During her career she accumulated a total of 159 high-speed furlongs with a five-month layoff following the 2022 Saratoga Meet. Her average career work week-to-rest week ratio was 1.38, a slightly greater number of work weeks to rest weeks. This is typical for most Thoroughbred racehorses. In the 12 weeks leading up to the incident race her work week-to-rest week ratio increased to 5.0. This represents a significant increase in the exercise intensity of this filly in the weeks leading up to the incident race.

Risk Factors for fatal musculoskeletal injury:

- Races on a dirt racetrack
- Races less than seven furlongs
- Previously on Veterinarian's List (July 5, 2022 – Intra-articular injection)

- Change in race frequency

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: Giddings, who trained Maple Leaf Mel from the start of her career, indicated the horse had always been healthy, never left the racetrack grounds, and had never had surgery for any purpose. She did miss two months of training in 2022 due to minor shin soreness. Imaging of her shins in 2022 showed mild bone modeling.

Jockey Narrative: Rosario rode this horse in a race for the first time on August 5, 2022. He also previously breezed the horse. Rosario indicated he had no concerns and did not notice anything unusual in the paddock or while warming up the filly. He also indicated that she had no trouble leaving the gate, was responsive to urging during the race, did not drift in or out, and she did not contact any other horse during the race.

Veterinary Narrative: A statement was not obtained.

Necropsy Findings: Significant necropsy findings for Maple Leaf Mel included an open displaced lateral condylar fracture in the right forelimb. The third metacarpal bone was completely exposed via an 8 cm by 4 cm by 5 cm rent in the craniomedial skin and soft tissue structures. The exposed ligaments were severely frayed and encrusted in dark red exudate and gritty dirt. The exposed bone was covered with similar material. Distal to the third metacarpal bone, the limb was completely disarticulated. There was no evidence of pre-existing musculoskeletal pathology.

Conclusion: This was an exercise-associated racing fatality caused by a musculoskeletal injury of the right front fetlock. In addition to the risk factors listed above, the increase in work intensity (approximately four times that of his average career work intensity) leading up to the training incident likely contributed to increased risk for FMSI.

9. EVER SUMMER, Fatality Classification: Racing

Incident: On August 6, 2023, Ever Summer, a four-year-old bay filly, trained by Mr. Christophe Clement and owned by Mr. Brereton C. Jones, experienced a condylar fracture and a biaxial proximal sesamoid bone fracture with dislocation of her left front fetlock while competing in the 4th race, a 1 3/8-mile Allowance Optional Claiming race on the Inner Turf Course. This filly was not in for a claim. The jockey was Mr. Irad Ortiz, Jr. The weather was clear, and the track was rated as good. The race was off at 2:45PM. Ever Summer appeared to be galloping normally at the back of the field when, entering the far turn, she fell in the vicinity of the 1/4 pole. She was attended by NYRA Regulatory Veterinarian, Dr. Justin MacNaughton, and was humanely euthanized due to the severity of this injury and a poor prognosis for recovery. Chart notations included the following comments:

> "EVER SUMMER settled on the outside while traveling three to four wide, was asked on the final turn, suffered an injury outside the quarter-pole and fell then was euthanized on the course."

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	9	2	1	1	$ 144,670
2023	3	1	1	0	$ 102,250
2022	4	1	0	1	$ 34,020
2021	2	0	0	0	$ 8,400

Ever Summer's racing career spanned three years, running twice as a two-year-old, four times as a three-year-old, and three times as a four-year old. Ever Summer accumulated 23 high-speed furlongs prior to her first start and accumulated a career total of 228 high-speed furlongs. She had two substantial layoffs: a 32-week layoff in 2022, and an 18-week layoff in 2023. Her average career work-to-rest week ratio was 0.68, meaning that she had slightly more rest weeks than work weeks. In the 12 weeks leading up to the incident race, her work-to-rest week ratio increased to 3.0, representing a significant increase in her exercise intensity.

Risk Factors for catastrophic musculoskeletal injury:

- Repeated 60-day layups
- Previously on the Veterinarian's List (November 18, 2022 – DNF)
- Change in race frequency

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: Trainer Clement trained this horse as a two-year-old, indicating that she was in very good condition. This filly did not miss any training due to illness or soreness and had never experienced surgery of any kind. She was placed on a Veterinarian's List when she fell during a November 18, 2022 race at Aqueduct after clipping heels of another horse. Clement advised that no exercise rider, groom or jockey ever expressed concern regarding unsoundness of the filly. Overall, Ever Summer was examined by a veterinarian on a weekly basis as part of a routine stable review. Dr. Larry Bramlage of Rood & Riddle Equine Hospital Lexington radiographed Ever Summer in 2022, finding bone bruising but nothing out of the ordinary. She did leave racetrack grounds to winter in Kinsham, Herefordshire, England. Trainer Clement indicated that the turf course was "a touch uneven, perhaps" and that the turf was "a bit chewed up after the rain."

Jockey Narrative: A statement was not obtained.

Veterinary Narrative: A statement was not obtained.

Necropsy Findings: Significant necropsy findings included an open lateral condylar fracture of the left forelimb in which the metacarpus was nearly completely exposed via a circumferential rent in the surrounding skin and soft tissue structures. The skin edges and exposed ligaments were severely frayed and encrusted in dark red exudate and gritty dirt. The exposed bone was covered in similar material. The fetlock joint was completely disarticulated and there was a complete rupture of the suspensory ligament at the level of the proximal sesamoid bones. There was no evidence of pre-existing musculoskeletal pathology. The right forelimb was within normal limits.

Conclusion: This was an exercise-associated racing fatality caused by a musculoskeletal injury of the left front fetlock. In addition to the risk factors listed above, the increase in work intensity leading up to the training incident (more than four times that of his average career work intensity) likely contributed to increased risk for FMSI.

10. CLOSED CAPTION, Fatality Classification: Training

Incident: On August 6, 2023, Closed Caption, a three-year-old chestnut filly, trained by Mr. Kenneth McPeek and owned by Harold Lerner LLC, Nehoc Stables and Magdalena Racing, experienced a comminuted biaxial proximal sesamoid bone fracture of the left front fetlock at the 5/8 Mile pole while breezing on the Main Track. The weather was clear, and the track was rated as fast. She was attended by Dr. Luis Castro and humanely euthanized due to the severity of the injury and a poor prognosis for recovery.

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	3	1	1	0	$74,970
2023	0	0	0	0	$ 0
2022	3	1	1	0	$74,970

Closed Caption's racing career spanned two years. She accumulated 41 high-speed furlongs prior to her first start in September of 2022. In her total career she accumulated 121 high-speed furlongs. She raced three times in 2022 and did not race in 2023. She had a 12-week layup in the Spring of 2022, a 13-week layup in the Fall of 2022 and a 16-week layup in 2023. The fatal musculoskeletal injury occurred in her second official timed workout since being placed on the Veterinarian's List in Kentucky as unsound. Her total career work to rest week ratio was 0.70 a reflection of two extended layup periods in 2022. In the 12 weeks leading up to the incident workout, her work-to-rest-week ratio decreased to 0.17, meaning she experienced a significant decrease in what was an already unusually light exercise intensity in the weeks leading up to the incident workout.

Risk Factors for fatal musculoskeletal injury:

- Racing on a dirt racetrack
- Repeated 60-day layups
- Currently on the Veterinarian's list (April 7, 2023 – Unsoundness)
- Previously on the Veterinarian's list (July 22, 2023 – Intra-articular Injection)
- Races less than seven furlongs
- Change in race frequency

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: A statement was not obtained.

Rider Narrative: A statement was not obtained.

Veterinary Narrative: A statement was not obtained.

Necropsy Findings: Significant necropsy findings included a severe biaxial proximal sesamoid bone fracture of the left forelimb. Severe, locally extensive, acute myofascial hemorrhage and edema were also found adjacent to the metatarsophalangeal (fetlock) joint. There was no evidence of pre-existing musculoskeletal pathology.

Conclusion: This was an exercise-associated training fatality that caused by a musculoskeletal injury of the left front fetlock. The FMSI occurred during a regular workout prior to the trainer seeking to have Closed Caption removed from the Veterinarian's List. In addition to the risk factors listed above, the unusually light exercise history of this filly in the weeks prior to her injury at Saratoga may have contributed to increased risk for FMSI.

11. WISECRAKEN, Fatality Classification: Racing

Incident: On August 16, 2023, Wisecraken, a three-year-old bay gelding, trained by Ms. Michelle Nevin and owned by Ironhorse Racing Stable, LLC, experienced a FMSI of the right hind limb during the fifth race, a 1 1/8-mile Starter Allowance race run on the Mellon Turf Course. The jockey was Mr. Ricardo Santana, Jr. The weather was cloudy, and the track was rated as good. The race was off at 3:28PM. Wisecraken appeared to be moving normally until the top of the stretch when his forelimb gait became shortened and "stabby" (characterized by a shortened cranial phase of the stride). Santana appeared to have difficulty in pulling him up. Chart notations included the following comments:

> "WISECRAKEN was hustled from the gate, showed the way on the inside with company to his outside, was asked on the far turn, suffered an injury to his right hind leg near the five-sixteenths pole and was pulled up then vanned off."

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	5	1	0	0	$ 27,800
2023	2	1	0	0	$ 25,850
2022	3	0	0	0	$ 1,950

Wisecraken's racing career spanned 13 months. He accumulated 39 high-speed furlongs prior to his first start, and he accumulated a total of 157 high-speed furlongs during his racing career. He started three times in 2022 and twice in 2023. He had a career work week-to-rest week ratio of 1.19. In the 12 weeks prior to the incident race his work to rest week ratio increased to 5.0.

Risk Factors for fatal musculoskeletal injury:

- Male horse
- Previously on the Veterinarian's List (June 27, 2023 - 180-day layoff)

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: Trainer Nevin reported the horse was in very good condition, and had not missed training due to illness, injury, or soreness. She also said that this horse had never experienced surgery of any kind. She further indicated that no exercise rider, groom, or jockey ever advised her of unsoundness. Wisecraken was last examined by a veterinarian for the pre-race examination. Nevin indicated she believed the turf course was soft before the incident race.

Rider Narrative: A statement was not obtained.

Veterinary Narrative: A statement was not obtained.

Necropsy Findings: Significant necropsy findings included a severe open complete lateral condylar fracture of the right hind cannon bone, a partial rupture of the suspensory ligament, traumatic articular cartilage erosion of both proximal sesamoid bones, locally extensive myofascial hemorrhage and edema. The left hindlimb was within normal limits.

Conclusion: This was an exercise-associated racing fatality caused by a musculoskeletal injury of the right hind fetlock. In addition to the risk factors listed above, a significant increase in work intensity (more than four times that of his average career work intensity) leading up to the race likely contributed to increased risk for FMSI.

12. ART COLLECTOR, Fatality Classification: Other

Incident: On August 9, 2023, Art Collector, a six-year-old bay horse trained by Mr. William I Mott and owned by Mr. Bruce Lunsford, became lame in the right forelimb. Attending Veterinarian, Dr. Peter Hannigan of Hagyard Equine Medical Institute, diagnosed and treated the horse for a foot abscess in that limb. On August 15, 2023, Art Collector appeared to be experiencing laminitis and became lame in the left hindlimb. The following day, he became recumbent. Although radiographs of his front feet on August 15 and 16, 2023 were within normal limits, a radiographic examination on August 17, 2023 revealed laminitis in both front feet. Given the rapid progression and severe nature of the laminitis in all four feet and a poor prognosis for recovery, Art Collector was humanely euthanized by Dr. Hannigan on August 17, 2023.

Exercise Summary: Not applicable

Risk Factors for fatal musculoskeletal injury: Not applicable

Drug test results: Not applicable

Trainer Narrative: A statement was not obtained

Rider Narrative: A statement was not obtained

Veterinary Narrative: A statement was not obtained

Necropsy Findings: Significant necropsy findings included severe, subacute laminitis in all four limbs, with the hindlimbs surprisingly more affected. In all four limbs the distal phalanx (P3) was sunken and rotated ventrally. There was detachment of the dermal laminae from the dorsal hoof wall and expansion of the corium by dark red gelatinous material. No other musculoskeletal abnormalities were appreciated.

Conclusion: The development of an abscess in the right front foot of this horse was the primary incident that likely caused secondary supporting leg lameness in other limbs. The resulting laminitis in all four feet was unresponsive to medical treatment.

13. BURNING BRIGHT, Fatality Classification: Racing

Incident: On August 23, 2023, Burning Bright, a six-year-old bay gelding, trained by Mr. Norm Casse and owned by AJ Suited Racing Stable, LLC and Mr. David Levitch, Sr., experienced exercise-associated sudden death (EASD) in the 7th race, the 1 5/8-mile John's Call Stakes (Listed) in the vicinity of the 7/8 pole of the Mellon Turf Course. The jockey was Mr. Luis Saez. The weather was clear, and the track was rated as firm. The race was off at 4:36PM. Burning Bright was moving well in hand to the 1-mile pole, at which point he turned and ran through the inside rail, unseating Saez. Chart notations included the following comments:

> "BURNING BRIGHT bumped with an opponent at the start, jostled with two foes early, was rated outside in the two to three path, lost action badly on the second turn, veered in and hit the rail then fell and was reported to have suffered a fatal cardiac event."

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	15	3	5	0	$165,197
2023	4	0	2	0	$45,240
2022	4	0	1	0	$19,257
2021	4	2	1	0	$84,300
2020	3	1	1	0	$16,400

Risk Factors for fatal musculoskeletal injury: Not applicable

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: Trainer Casse indicated that this horse had never shown any indication of cardiac disease or exercise intolerance during his racing career.

Rider Narrative: A statement was not obtained.

Veterinary Narrative: A statement was not obtained.

Necropsy Findings: Significant necropsy findings included a ruptured thoracic aorta. There was extensive hemorrhage surrounding the ascending aorta and the branching vessels in the thoracic cavity. The volume of blood found inside the pericardium (the fibrous membrane that encloses the heart) was sufficient to have caused cardiac arrest and sudden death.

Conclusion: This horse experienced an exercise-associated sudden death while racing as a direct result of a spontaneous tear of the wall of the thoracic aorta.

Aortic rupture is a rare condition in horses and is most commonly found in the Friesian breed.[1] In one study, the incidence was only three out of 984 deaths of young race horses.[2] It is seen most commonly in older male horses after breeding or after intense exercise. Aortic rupture may occur suddenly without warning or result from a congenital aneurysm of the aortic root. In this case there were no predisposing clinical signs to indicate cardiac disease.

14. LA AGUILILLA, Fatality Classification: Racing

Incident: On August 25, 2023, La Aguililla, a seven-year-old chestnut mare, trained and owned by Mr. David Jacobson, was pulled up past the wire in the 2nd race, a seven Furlong Claiming Race (16,000nw2/L) on the Main Track with an injury of the left forelimb. The jockey was Mr. Manuel Franco. The weather was cloudy, and the track was rated as muddy and was sealed. The race was off at 1:46PM. No obvious abnormalities were observed during the race itself. Chart notations included the following comments:

> "LA AGUILILLA chased just off the inside down the backstretch and then three wide through the turn getting placed to coaxing at the three-eighths, went seven wide into upper stretch, tired, then took a bad step just after the finish and was pulled up and subsequently vanned off."

La Aguililla was placed in a splint and ambulanced to the barn where she was initially attended to by Dr. Michael Galvin. Radiographic examination revealed that no fractures were apparent in the affected limb. However, a suspensory ligament injury was suspected due to the inability of La Aguililla to maintain the normal angle of the left front fetlock joint.

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	39	1	7	12	$ 159,467
2023	9	0	2	2	$ 33,063
2022	11	0	1	5	$ 33,380
2021	1	0	0	0	$ 500
2020	7	0	3	2	$ 45,094
2019	9	0	1	3	$ 27,150
2018	2	1	0	0	$ 20,280

La Aguililla's racing career spanned six years. She accumulated 26 high-speed furlongs prior to her first start and a total of 540 high-speed furlongs during her racing career. She made two starts in 2018, nine starts in 2019, seven starts in 2020, only one start in 2021, 11 starts in 2022 and nine starts in 2023. She experienced two significant layoffs, a 31-week layup in 2020 and a 48-week layup in 2021. Her career work to rest week ratio was 0.65. Her work to rest week ratio for the 12 weeks leading up the incident race was 0.83.

Risk Factors for fatal musculoskeletal injury:

- Racing on a dirt racetrack
- Racing in a claiming race
- Repeated 60-day layups

- Previously on the Veterinarian's List (June 6, 2023 – Sick)

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: A statement was not obtained

Rider Narrative: A statement was not obtained

Veterinary Narrative: Although the initial radiographic examination of La Aguililla revealed that no fractures were apparent in the affected limb, a suspensory ligament injury was suspected due to apparent loss of the normal support required to maintain the normal angle of the fetlock joint. On September 1, 2023, La Aguililla was referred to the Rood & Riddle Equine Hospital in Saratoga for further evaluation and treatment. She was attended by Dr. Shannon Hinton. An ultrasound examination at that time revealed an injury (avulsion) of the proximal portion of the suspensory ligament at the point of origin on the palmar surface of the left front cannon bone. Due to the unusual location of the disruption of the suspensory apparatus, surgical treatment was not an option. La Aguililla was treated with a rigid aluminum splint and the right front foot was supported to prevent weight-shifting laminitis of that forelimb. On September 12, 2023, La Aguililla developed laminitis in the right front foot that was unresponsive to treatment and she was humanely euthanized by Dr. Hinton.

Necropsy Findings: Significant necropsy findings included multifocal, patchy areas of yellow and red discoloration (inflammation) in the suspensory ligament and the deep digital flexor tendon of the right forelimb from the level of the carpus extending to the second pastern bone. The distal articular surface of both the left and right front cannon bones were mildly roughened (degenerative joint disease). Upon sagittal sectioning of all four hooves, the following changes were found: left forelimb: the distal phalanx (P3) was sunken and rotated ventrally. There was detachment of the dermal laminae from the dorsal hoof wall and expansion of the corium up to 5 mm by dark red gelatinous material. The distances between the proximal aspect of P3 and the hoof wall and the distal aspect of P3 and the hoof wall were 0.8 cm and 1.8 cm, respectively; right forelimb, left and right hind limbs: the distances between the proximal aspect of P3 and the hoof wall and the distal aspect of P3 and the hoof wall were 0.5 cm and 0.6 mm, respectively.

Conclusion: This horse experienced a musculoskeletal injury while racing. This was the only fatality that occurred in a claiming race. Due to the unusual location of the disruption of the suspensory apparatus, surgical treatment was not an option. When conservative treatment failed after she developed laminitis in the contralateral limb, La Aguililla was humanely euthanized. This mare had a very aggressive training and racing schedule, interrupted twice in 2021 and 2022 by extended layups of six and ten months respectively. Additionally, this s dropped in

class three times in the three-month period leading up to the incident race. In addition to the risk factors listed above, this pattern of exercise, considered in conjunction with an increased work intensity during the three months leading up to the incident race likely increased the risk for FMSI.

15. NOBEL (IRE), Fatality Classification: Racing

Incident: On August 26, 2023, Nobel (IRE), a four-year-old chestnut colt, trained by Mr. Brendan Walsh and owned by Qatar Racing, experienced an open disarticulated condylar fracture of the left forelimb, along with medial proximal sesamoid and proximal phalanx fractures in the 5th race, a 1 3/16-mile Allowance Optional Claiming race on the Mellon Turf Course. The Jockey was Mr. Tyler Gaffalione. The weather was clear, and the track was rated as good. This race went off at 1:57PM. Nobel (IRE) was not offered for claim. Nobel (IRE) illustrated no gait abnormalities during the race, but while galloping out on the clubhouse turn of the Mellon Turf, Nobel (IRE) fell and unseated Gaffalione. Nobel (IRE) was attended by NYRA Regulatory Veterinarian, Dr. Martha Misheff and humanely euthanized due to the severity of the injury and a poor prognosis for recovery. Chart notations included the following comments:

> "Nobel (IRE) went around the first turn in the 2 path, was unhurried at the back, came under urging while moving from the 2 path to the 4 path on the far turn, drifted inward in upper stretch, dropped further in near the furlong marker, chased the vanguard to the finish and lacked the needed kick then suffered a catastrophic injury on the gallop out and was euthanized on the course."

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	7	3	0	0	$ 41,546
2023	4	1	0	0	$ 31,039
2022	2	1	0	0	$ 5,859
2021	1	1	0	0	$ 4,648

Nobel (IRE)'s racing career spanned 20 months. He accumulated a total of 72 high speed furlongs during his racing career. This number is unusually low and is likely because he trained and raced outside the United States for most of his career in locations that do not record official timed workouts. Similarly, there is no record of how many high-speed furlongs were completed prior to his first race on December 8, 2021. Nobel (IRE) raced September 25, 2022 and October 19, 2022. In 2023 Nobel raced four times in 2023 (May 19, 2023, July 1, 2023, July 15, 2023 and August 26, 2023). The interval between his last four races was five weeks, one week and six weeks. His career work to rest week ratio was 0.08. In the 12 weeks leading up to the incident race, his work to rest week ratio was 0.38.

Risk Factors for fatal musculoskeletal injury:

- Intact male horse
- Repeated 60-day layups
- Change in race frequency

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: A statement was not obtained.

Rider Narrative: A statement was not obtained.

Veterinary Narrative: A statement was not obtained.

Necropsy Findings: Significant necropsy findings included an open lateral condylar fracture of the left thoracic limb with complete articular displacement. The medial proximal sesamoid bone was completely avulsed. There was also a comminuted spiral fracture of the proximal pastern bone. Hemorrhage was found in the surrounding soft tissue structures. No pre-existing musculoskeletal pathology was identified.

Conclusion: This was an exercise-associated racing fatality caused by a musculoskeletal injury of the left front fetlock. Given that Nobel (IRE) mostly trained outside the United States, limited information is available to determine an accurate exercise history that may have contributed to increased risk for injury. In addition to the risk factors listed above, the increase in work intensity leading up to the incident race (approximately five times that of his average career work intensity) likely contributed to increased risk for FMSI. Importantly, Nobel (IRE) had no opportunity to acclimate to the Saratoga racing surface with only a single four-furlong high-speed workout on August 20, 2023, just six days prior to the incident race on August 26, 2023.

16. NEW YORK THUNDER, Fatality Classification: Racing

Incident: On August 26, 2023, New York Thunder, a three-year-old bay colt, trained by Mr. Jorge Delgado and owned by AMO Racing, USA, experienced a comminuted midshaft fracture of the left front cannon bone while racing in the 9th race, the seven-furlong G1 H. Allen Jerkins Memorial Stakes on the Main Track. The jockey was Mr. Tyler Gaffalione. The weather was clear, and the track was rated as muddy and was sealed. The race was off at 4:22PM. New York Thunder showed no gait abnormalities during the race until the moment he fell while changing leads in the vicinity of the 1/16th pole. The track condition at that time was "muddy." He was attended to and euthanized by NYRA Regulatory Veterinarian Dr. Danielle Schilpp due to the severity of the injury and a poor prognosis for recovery. Chart notations included the following comments:

> "NEW YORK THUNDER went to the front, showed the way under pressure from the outside, vied in the two then three path on the turn, shook clear nearing the quarter-pole then spun four wide into the stretch, drew off into the final furlong, suffered a catastrophic injury outside the sixteenth-pole and fell then was euthanized on the track."

Exercise Summary:

	Starts	Firsts	Seconds	Thirds	Earnings
Career	5	4	0	0	$232,323
2023	3	2	0	0	$166,123
2022	2	2	0	0	$67,200

New York Thunder's racing career spanned two years. He raced twice as a two-year-old and three times as a three-year-old. During his career, he had no lay-offs longer than three weeks between workouts or races. His career work-to-rest-week ratio was 1.75. In the 12 weeks leading up to the incident race, his work-to-rest-week ratio was 1.4. The time intervals between his last four races were 17 weeks, 12 weeks, and three weeks.

Risk Factors for fatal musculoskeletal injury:

- Intact male horse
- Racing on a dirt surface
- Previously on Veterinarian's List (June 10, 2023 – Injured; June 11, 2023 – Intra-articular Injection; July 14, 2023 – Intra-articular Injection; August 12, 2023 – Intra-articular Injection)
- Change in racing frequency

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: A statement was not obtained.

Rider Narrative: A statement was not obtained.

Veterinary Narrative: A statement was not obtained.

Necropsy Findings: Significant necropsy findings included an open comminuted fracture of the left third metacarpal (cannon) bone. In the right forelimb there was a locally extensive area of subcutaneous hemorrhage at the level of the mid-diaphysis of the third metacarpal bone. There was a 2 cm superficial cutaneous laceration on the medial aspect of the left hock. No pre-existing musculoskeletal pathology was reported.

Conclusion: This was an exercise-associated racing fatality caused by a musculoskeletal injury of the left front fetlock. He was placed on the Veterinarian's List, due to injury, on June 10, 2023, and was treated with intra-articular injections three times between June 11, 2023 and August 12, 2023. In the five months leading up to the incident race, New York Thunder was scratched from four races and placed on the Veterinarian's List four times. Given the unusual number of regulatory veterinarian interventions experienced by New York Thunder in the months leading up to the incident race, including one for an injury at Belmont Park in June, and three joint injections administered in a 31-day period, it is reasonable to conclude that unsoundness was likely a factor in those interventions and likely contributed to increased risk for FMSI. Despite this history, it is important to note that New York Thunder showed no evidence of unsoundness on the day of the race. He was determined to be fit to race following a pre-race inspection on the morning of the race. He was also observed by NYRA Regulatory Veterinarians as he entered the paddock, during saddling, while warming up and as he was loaded into the starting gate. The attraction of competing at this boutique meet, even in the face of continued need for musculoskeletal therapy also likely contributed to increased risk for FMSI.

17. SHUTTERS, Fatality Classification: Other

Incident: On August 29, 2023, Shutters, a five-year-old bay gelding, trained by Mr. Mark Hennig and owned by HGS Thoroughbreds, was heard to be struggling and was found down in his stall at approximately 2:15PM. Although not this horse's attending veterinarian, Dr. Hunt, who maintains an on-track veterinary practice, was summoned to examine the horse. Shutters died before Dr. Hunt arrived at the barn. Subsequently, Dr. Sarah Hinchliffe, obtained a post-mortem blood sample that was submitted to HIWU for testing.

Exercise Summary: Not applicable

Risk factors for fatal musculoskeletal injury: Not applicable

Drug test results: The Commission has not been advised by HIWU of any improper or unlawful medication violations found in this horse at the time of injury.

Trainer Narrative: A statement was not obtained

Rider Narrative: Not applicable

Veterinary Narrative: Shutter's Attending Veterinarian, Dr. Bonnie Comerford, reported that no medication had been administered by her to this horse prior to this incident.

Necropsy Findings: Significant necropsy findings included a 6.0 cm round, 1.5 cm raised region over the proximal portion of the left jugular vein. The surrounding subcutaneous connective tissues are expanded by gelatinous, dark red, fluid (hemorrhage and hematoma). On the luminal aspect of the jugular vein, there were dozens of pinpoint dark roughened spots over the superficial and deep aspects of the vein, presumed to be from venipunctures. On the luminal aspect of the common carotid artery, there was one similar pinpoint focus of roughened intima, The pericardial sac contains 600mL of dark red, watery liquid (hemorrhage). In the peritoneal cavity is 300mL of dark red, watery liquid (hemorrhage). All points of hemorrhage and pooling blood have minimal clot formation. On the luminal surface of the trachea are hundreds of pinpoint red foci (hemorrhage). The left iliopsoas muscle has a locally extensive, dark red area (hemorrhage). On the glandular and non-glandular luminal surface of the stomach, randomly scattered, are dozens of circular erythematous areas of mucosa that are up to 1 cm in diameter (erosions). Gross findings revealed a hematoma over the left jugular vein. This focus of hemorrhage is presumed to be from an iatrogenic arterial puncture during attempted venipuncture as there was indications of pinpoint penetration associated injury of the carotid in this region. The iliopsoas hematoma formation is presumptively secondary to the presumed seizure and may be exacerbated by a presumed coagulopathy. It is also possible

that the coagulopathy led to an intracranial hemorrhage that led to a seizure although no evidence of intracranial hemorrhage was seen on limited sectioning of the brain at this time. Further support for the presumed coagulopathy included: copious hemorrhage pouring from vasculature during initial dissection, continued hemorrhage from venipuncture site postmortem, and abundant unclotted hemorrhage in the pericardial sac. The gastric erosions are mild and are likely associated with stress. Histologic examination revealed diffuse hemorrhage and congestion throughout the body in various tissues, which was suspected on gross examination. Toxicologic testing for anticoagulant rodenticides revealed diphacinone exposure but detected below the limit of quantification (30 ppb).

Conclusion: The clinical history, necropsy findings and toxicology results are consistent with the possibility that chronic exposure to low doses of diphacinone, a rodenticide that may have induced a coagulopathy in this horse that resulted in sudden death and that the intra-articular injection could have been made accidently in the process of collecting a blood sample for drug testing post-mortem. Although the plasma levels of diphacinone were well below the minimum toxic dose in this horse, similar levels of exposure have been reported to be associated with sudden death at California racetracks. It was hypothesized in one published manuscript that strenuous exercise or exercise in combination with other management practices at racetracks may alter the toxicity threshold for anticoagulant rodenticides in racehorses.[3]

VIII. Medication Violations

Blood samples were collected from all horses that experienced fatality during the 2023 Saratoga Meet and were submitted to HIWU for screening. To date, HIWU has not advised the Commission of any medication violations found in the samples, nor has HISA made public any adverse findings regarding the trainers of these horses.

IX. Individual Horse Risk Factors for FMSI

There are many risk factors that can contribute to FMSI of Thoroughbred racehorses. Some factors are modifiable, others are not. Risk factors may be classified as individual horse risk factors or collective risk factors. Collective risk factors are those that affect all horses at a racetrack. Some risk factors have a greater priority than others. For example, research studies have found a strong association between a horse being on the Veterinarian's List and fatal injury. Even after coming off the Veterinarian's List, these horses remain at increased risk of dying prematurely.[4]

Risk factors for equine FMSI are additive. The more risk factors that apply to an individual horse, the greater the risk for injury.

In 2019, Dr. Tim Parkin, Equine Data Analytics Ltd, was commissioned by The Jockey Club to investigate risk factors for catastrophic musculoskeletal injury specific to 15 Mid-Atlantic racetracks in New York, Pennsylvania, New Jersey, Maryland, Virginia and West Virginia between 2010 and 2018. During that period, the overall risk for fatal injury was 1.97 fatalities/1000 starts. The following 10 individual horse risk factors were identified:

- Older horses at their first start (three-year-old and older)
- Male horses (geldings and intact male horses)
- Racing on a dirt racetrack
- Starting in a claiming race of any kind
- Repeated lay-ups of more than 60 days prior to the incident race
- Horses currently on the Veterinarian's List
- Horses that were ever on the Veterinarian's List
- Races less than seven furlongs
- Recent change in trainer (first 30 days with the new trainer)
- Horses with more starts between 61-90 days prior to the incident race and have no starts within 30 days of the incident race

There was considerable variation among the 12 horses that experienced exercise-associated FMSI during the 2023 Saratoga Meet. Two horses had five out of 10 individual horse risk factors in play at the time of their incident event. Three horses had four risk factors. Four horses had three risk factors and three horses had two risk factors. See **Table 3**.

	Horse Name											
Risk Factor	**Frigid Lady**	**Winter Son**	**Blame It On Mary**	**Lawful**	**Sopran Basilea (IRE)**	**Maple Leaf Mel**	**Ever Summer**	**Closed Caption**	**Wisecraken**	**La Aguililla**	**Nobel (IRE)**	**New York Thunder**
Older than 2 at first start	0	0	0	0	1	0	0	0	0	0	0	0
Male horse	0	1	0	1	0	0	0	0	1	0	1	1
Racing on a dirt racetrack	1	1	0	1	0	1	0	1	0	1	0	1
Racing in a claiming race	0	0	0	0	0	0	0	0	0	1	0	0
Repeated 60-day lay-ups	0	1	0	0	1	0	1	1	0	1	1	0
Currently on Veterinarian's List	0	0	0	0	0	0	0	1	0	0	0	0
Ever on Veterinarian's List	1	1	1	0	1	1	1	1	1	1	0	1
Races less than seven furlongs	0	0	0	0	0	0	0	0	0	0	0	0
Recent change in trainer	0	0	0	0	0	0	0	0	0	0	0	0
Change in race frequency	0	1	1	1	1	1	1	1	0	0	1	1
TOTAL	**2**	**5**	**2**	**3**	**4**	**3**	**3**	**5**	**2**	**4**	**3**	**4**

Table 3*. Individual horse risk factors for the 12 horses that experienced exercise-associated FMSI during the 2023 Saratoga Meet. Although Blame It On Mary, Ever Summer and Nobel (IRE) were entered in Allowance Optional Claiming Races, none of these horses were in for a claim.*

X. Collective Risk Factors

Risk factors for FMSI are cumulative. While individual horse risk factors are unique to each individual horse, collective risk factors include environmental factors - weather, racing surfaces, meet schedules and facility design. These apply to all horses and may be common to multiple racetracks or unique to a racing facility. Boutique race meets are a collective risk factor, as they impose unique conditions upon horses and trainers that can increase risk for injury, including:

- Some horses that ship-in to race at Saratoga have minimal or no time to adapt to the Saratoga racing surface.
- The unique opportunity to compete in a prestigious race with a high purse structure incentivizes risk.
- Boutique meets have inflexible schedules during a brief time frame.
- To be competitive in boutique meets, trainers must condition horses for peak performance in targeted races.
- Setbacks in the training schedule may incentivize risk when the alternative is to miss the scheduled race and disappoint stakeholders with expectations of participation in these prestigious races.

The collective risk factors, unique to the 2023 Saratoga Meet, were analyzed in depth.

A. The Racing Surfaces

1. Background

Research studies that investigated an association between racetrack surface conditions and risk for racing injury have found conflicting results.

A 1986 study analyzed track condition, dirt and turf surfaces, environmental conditions and other individual risk factors, concluding that those conditions “were of no importance in the occurrence of racing injuries to Thoroughbred horses in NY”.[5] A 1992 retrospective study that sought to determine risk factors that predisposed horses to severe injuries found a significant association between track surface conditions and severe injury. In that study, horses that raced at Saratoga and Belmont were more likely to experience a severe injury than those that raced at Aqueduct. They also found horses that raced on a muddy track at Belmont had a significantly increased risk compared to horses that raced on the Aqueduct dirt.[6]

A 2001 study of British turf racecourses found that softer racing surfaces were associated with fewer fatalities and injuries than firmer surfaces.[7] In 2004, a study found rainfall at the time of a race was associated with falling in both hurdle and steeplechase racing.[8] A 2005 study examined

fractures of racehorses in Japan during flat racing with special reference to track conditions and race time. This study found that race times were longer on turf courses as the tracks became softer and race times became shorter in muddy conditions, concluding that variation in the incidence of fracture with track condition might be due to the corresponding difference in race time.[9] In 2010, a case control study investigated race and course-level risk factures for fatal distal limb fracture at United Kingdom racecourses in an effort to understand the variation in rates of equine fatality at different facilities. They found that firmer going was associated with increased risk for fracture and concluded that the condition of the racecourse may be an important risk facture. This study recommended that future research focus on the identification of course maintenance techniques that produce the safest possible racing surfaces.[10] During the 2015 Grayson Jockey Club Research Foundation Welfare & Safety of the Racehorse Summit, one researcher presented a further analysis of the condition of the racing surface and the risk of equine fatalities in which he found that there was a positive correlation between racing on an “off dirt” surface and risk for equine fatalities.[11]

A more recent analysis of The Jockey Club’s Equine Injury Database racing fatalities and surface and track conditions was conducted during the 2021 and 2022 racing seasons. The investigators found that there no significant differences in the incidence of equine fatality associated with track condition on either dirt or turf surfaces. In this study, there were 419 fatalities in 308,954 starts on fast dirt tracks for a fatality incidence rate of 1.36/1000 starts, while there were 58 fatalities in 43,021 starts on either muddy or sloppy dirt racetracks for a fatality incidence rate of 1.35/1000 starts. On turf surfaces there were 91 fatalities in 81,434 starts on tracks rated as firm for a fatality incidence rate of 1.12/1000 starts compared to 11 fatalities in 14,284 starts on either good, soft or yielding surfaces for a fatality incidence rate of 0.77/1000 starts.[12] Finally, a recent study of racehorse fatalities in the New Zealand Thoroughbred racing seasons 2011 - 2022 found that firmer track conditions increased risk for fatal musculoskeletal injury, supporting the findings of the 2010 study conducted in the United Kingdom.[13]

The unprecedented amount of rainfall during the 2023 Saratoga Race Meet provided a unique opportunity to further investigate the possible association of racetrack surface conditions and the risk for FMSI of horses.

2. NYRA Track Maintenance Equipment

The equipment used to condition Saratoga racing surfaces is state-of-the art and is maintained in excellent condition. The personnel that maintain the racing surfaces are well-trained, and use best practices developed

over decades of experience in maintaining both dirt and turf racetracks. NYRA racetrack personnel employ a robust Maintenance Quality System (MQS) that includes daily recording of weather, racetrack moisture and details of equipment used to condition and maintain the racing surfaces. See **Appendix B** for a description of each piece of equipment and the role that they play in conditioning the dirt racetrack.

***Figure 9**. State-of-the-art racetrack maintenance equipment is used daily at the Saratoga Race Couse to condition the dirt racetracks for both training and racing. (Photograph by Scott E. Palmer)*

3. NYRA Racetrack Maintenance Protocols

For nearly a decade, NYRA has conducted extensive and continuous testing of all Saratoga Race Course racing and training surfaces before, during and after each Race Meet. Professor Michael "Mick" Peterson, Ph.D., Director of the Racetrack Safety Program at the University of Kentucky, Martin-Gatton College of Agriculture, Food and Environment, has been engaged to perform enhanced testing and analysis of NYRA's racing surfaces. The Main Track and both turf courses are inspected before, during and after each race day. Data and soil samples are shared with independent engineers, who evaluate the condition and consistency of each surface.

Before any meet, the Racing Surfaces Testing Laboratory (RSTL) team performs comprehensive sampling and analysis of the following:

- Laboratory testing of the track material (sand, silt and clay)
- Inspection of the base and cushion using ground-penetrating radar

- Inspection of the overall performance and consistency of the surface using the Biomechanical Surface Tester, which replicates loads and speed of a Thoroughbred's leading forelimb at the gallop

Professor Peterson's Racing Surfaces Testing Laboratory has been the primary provider of testing services both on-site and material testing in their laboratory. Additional laboratories engaged by NYRA to evaluate their racetracks are Environmental Technical Services in Woodbine, Michigan and Mueser Rutledge Consulting Engineers in New York, New York.

NYRA utilizes daily measurements of each racing surface, keeps logs of maintenance work, and monitors and records weather conditions. Before and after each day of racing, NYRA measures cushion depth and moisture content of the Main Track to ensure the readings are within pre-determined criteria established in a MQS database. NYRA pioneered the use of this MQS database system that utilizes both daily measurements and enhanced data collection to create and maintain safe and consistent track surfaces.

Maintenance of all tracks, including watering, harrowing, grading, and other measures are logged and compared with surface measurements and weather reports to provide comprehensive analysis. All data is shared with Dr. Peterson in real time, allowing his team to provide analysis and feedback. All track maintenance decisions and actions are supported by scientific data matched with current and forecast weather conditions.

Since July 1, 2022, HISA Racetrack and Racing Surface Monitoring and Maintenance Rules 2151, 2152, and 2154 have been in effect. Racetracks are required to maintain written operating procedures that detail maintenance equipment and how racing and training surfaces are maintained as a normal part of operations. Pre-Race Meet surface testing is also required, as is daily testing of a racetrack to monitor changes that occur because of weather or use, and to document surface response to maintenance procedures. HISA has posted a Summary for Racetrack Maintenance Handbook, which is intended to provide narrative overview of their racetrack maintenance rules. While the Handbook uses permissive language regarding operations, it is the understanding of the Commission that NYRA operations during the Saratoga Meet complied with all rules.

Pursuant to a 2008 Franchise Agreement by and among NYRA, The State of New York, and The New York State Franchise Oversight Board (FOB), NYRA is obligated to maintain and operate training surfaces at Saratoga Race Course during the period from at least April 15 through November 1 of each year, subject to weather conditions. Accordingly, NYRA opens the Oklahoma Training Facility and maintains its use during the required

timeframe. The Main Track at Saratoga Race Course is open for a much more limited period, from the second week in July through the first week in September but is otherwise closed for the remainder of the year.

In 2017, Saratoga Race Course experienced a spate of fatalities on the Main Track during the first two weeks the Meet. Following that Race Meet, a protocol was developed to ensure that the dirt racing surface is appropriately graded, material added, or existing materials adjusted, and moisture applied to ensure a safe and consistent racing surface.

Prior to opening the Oklahoma Training Track in April 2023, Sieve and Hydrometer Particle Size Distribution Testing of the composition of the dirt training track found the cushion to be 91.2 percent sand, 6.8 percent silt and 2.0 percent clay. The total fine particle composition (% silt + % clay) was measured at 8.8 percent. The moisture content was 7.9 percent. These findings were consistent with the same measurements taken in the previous four years (2019 through 2022). Laser Diffraction Particle Size Distribution Testing at the same time found that the special composition of sand, silt and clay were consistent at seven locations around the Oklahoma Training Track. On July 7, 2023 and prior to the start of racing, similar composition testing was performed on samples obtained from the Main Track. The cushion of the Main Track found the cushion to be 87.8 percent sand, 10.8 percent silt and 1.3 percent clay. The total small particle composition was 12.2 percent.

In 2023, NYRA commenced the grooming process to the Main Track on June 12, 2023, five weeks prior to the surface being used for training. The cushion of the dirt racetrack was pushed aside, the base was examined, and the grade of the track was surveyed. Samples of the cushion were sent to the Racing Surfaces Testing Laboratory and the Mueser Rutledge Consulting Engineers for analysis. Some additional material was added to the surface and the cushion was then conditioned with a harrow and water was added as needed. Three days prior to opening the Main Track for training, the surface was conditioned as it would be on a typical race day with a minimum of eight cycles of harrowing, watering, and backraking or floating the surface. The Main Track was sealed and rolled at the end of the each of the eight cycles of conditioning.

Review of NYRA records found that standard best practices were followed during the 2023 Saratoga Meet. These best practices included sealing the surface at the end of every race day to reduce evaporation and minimize the penetration of overnight rainfall. The Main Track was harrowed, and water added if needed prior to opening the Main Track for training at 5:30AM The Main Track was again harrowed during breaks in the training hours, to remove hoof prints in the cushion created by horses training over the surface.

At the start of the Meet, there was a single break during morning training hours to harrow and smooth the racetrack surface. By the end of the first week of August, it became obvious that the number of horses training over the Main Track in the morning was so high that an additional break was required to recondition the surface. The first break occurred at 6:30AM, and the second break occurred at 9:00AM. Prior to racing, the Main Track was harrowed, backraked, and rolled or floated to create a smooth uniform surface.

Consistency of the racing surface is integral to safety. Measurement of the thickness of the cushion of the Main Track is one of the metrics used to evaluate the racetrack for consistency. The cushion of the Main Track, measured daily at eight locations, was found to have an average cushion thickness of 3.75 inches throughout the entire Meet as seen in **Figure 10** below.

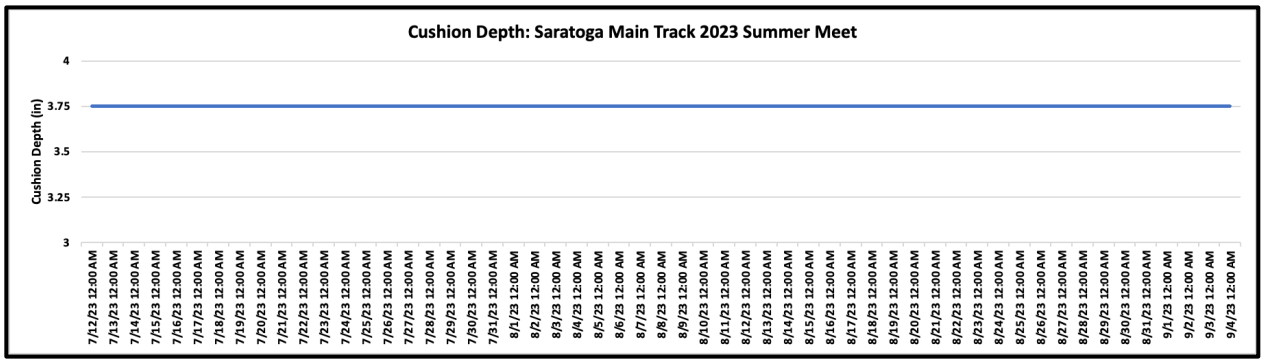

***Figure 10**. Cushion depth (3.75 inches) of the Saratoga Main Track was measured daily at eight locations around the circumference of the racetrack.*

B. Weather conditions at Saratoga Race Course

The 2023 Saratoga Meet experienced frequent severe thunderstorms with a total amount of rainfall recorded at 8.14 inches. In 2022 there was 7.77 inches of rainfall, while 2021 total rainfall was 8.67 inches. In the event of heavy rainfall during racing hours, the cushion was sealed, then the cushion was scratched or backraked to open it up after the storm. Both dirt tracks at Saratoga (Main and Oklahoma) have a limestone base to facilitate drainage. Sudden summer squalls created variation in the moisture content of the racetrack making it difficult to maintain a consistent racing surface throughout the day. The daily amount of precipitation measured by rain gauges located in the infield of the racetrack is shown in the chart below. For the most part, daily rainfall during the Meet was less than 0.2 inches. On two days there was approximately 0.4 inches of rainfall and on one day there was approximately 0.8 inches of rainfall.

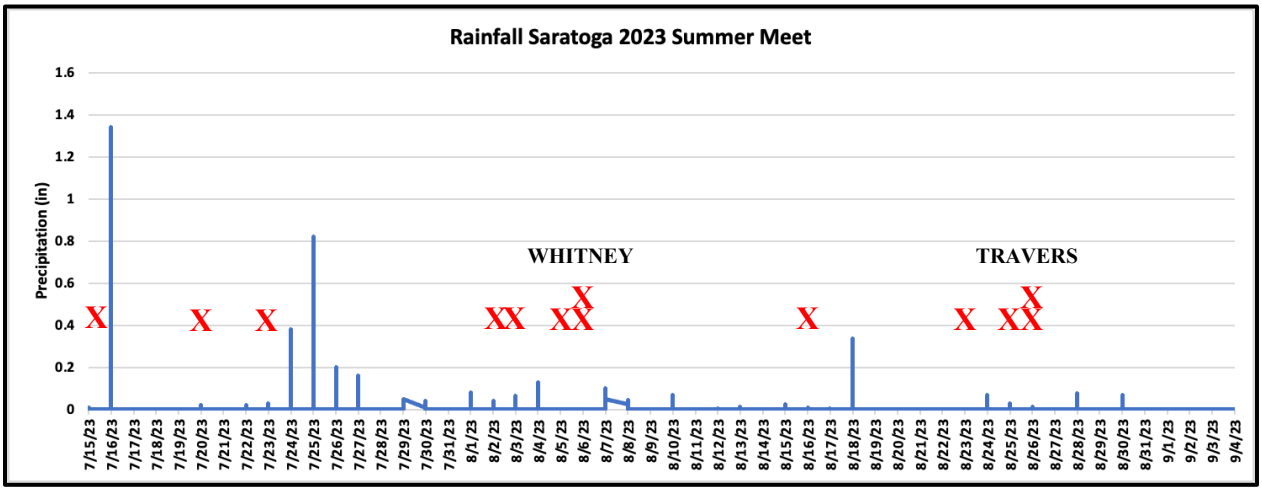

***Figure 11**. Daily rainfall in inches recorded during the 2023 Saratoga Meet. Days in which exercise-associated fatalities occurred are indicated with an **X**.*

Median daily rainfall on days of the 2023 Saratoga Meet when fatal musculoskeletal injuries (FMSI) occurred was compared with that on which there were no FMSI, using the Mann-Whitney U test.[a] Although the median daily rainfall on days when FMSI occurred (0.01 inches) was slightly greater than that on days of the Meet when no FMSI occurred (0.00 inches), this difference was not statistically significant ($p = 0.961$).

However, measurement of precipitation is an inexact science. Rain gauges often become contaminated with dirt, grass, or other organic material and are affected by wind. Rainfall measurements are subject to errors due to failure or disruption of the collection device. Rain gauge readings also may vary by location.

For example, there were times during the 2023 Saratoga Meet when rainfall measurements would differ between that measured by the NYRA weather station located in the infield of the Main Track and that measured at the Oklahoma Training Track across Union Avenue.

There have been conflicting rainfall measurements reported for the 2023 Saratoga Meet. For the purposes of this review, rainfall measurements recorded every 15 minutes by the NYRA weather station in the infield of the Main Track were used as a reference. It is interesting to note that except for rainfall measured during the first week of the Meet, the amount of weekly rainfall recorded by the NYRA rain gauges was similar to that measured at the National Weather Service (NWS) in Latham, New York, the closest NWS measuring location to Saratoga Race Course as seen in **Figure 12** below.

[a] The Mann-Whitney U test is a non-parametric test used for statistical analysis of non-parametric (not normally distributed) data from independent observations.

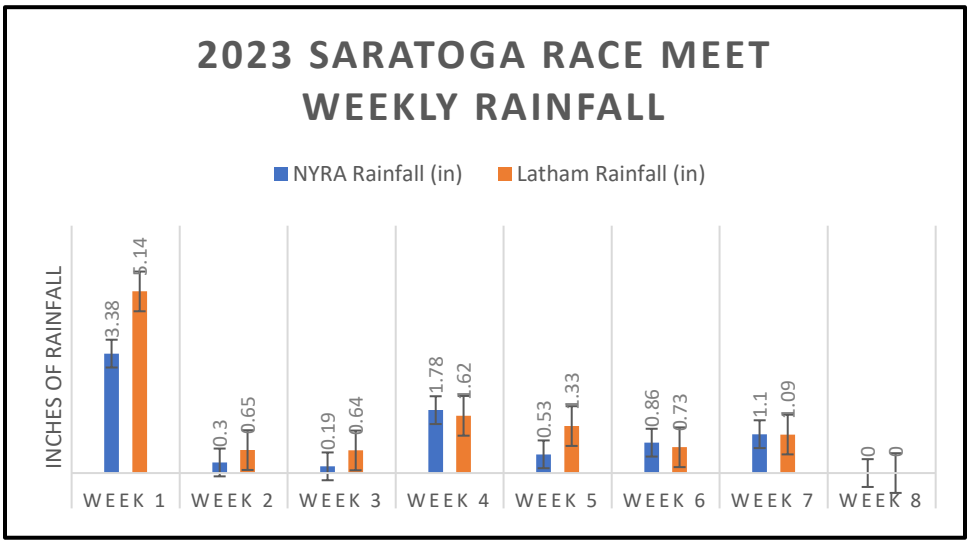

***Figure 12**. Comparison of the weekly rainfall recorded during the 2023 Saratoga Meet, using NYRA rain gauges in the infield of the Main Track and that provided by the NWS in Latham, New York.*

Although measurement of daily rainfall using current technology may not be a reliable metric to accurately characterize the daily moisture content of the racetrack, examination of weekly distribution of rainfall, measured either by NYRA or the NWS, confirms that rainfall was consistently present for seven of the eight weeks (88 percent) of the 2023 Saratoga Race Meet.

C. Moisture Content of the Racing Surfaces

A consistent racing surface is a safe racing surface. An inconsistent racing surface contributes to increased risk for FMSI. There are three components a dirt racetrack that must be consistent to ensure a safe racing surface: geometry of the surface, material composition, and moisture content. The most volatile of these components is moisture content. Moisture content of the cushion of a dirt racetrack is a function of the moisture added (rainfall and irrigation), the permeability of the surface material, and drainage beneath the surface. All elements were reviewed by the Commission Staff to determine the potential relationship between the racing surface and equine fatalities.

1. Main Track

The moisture content of the Dirt Track was measured daily during the 2023 Saratoga Meet, using Time Domain Reflectometry (TDR), as seen in **Figure 13**. On each race day, measurements are taken in the morning after training and prior to racing, and again after a race card was completed. On dark days, only morning measurements were obtained.

***Figure 13**. Time Domain Reflectometry (TDR) was used to obtain moisture content data from the Main Track. (Photograph by Scott E. Palmer)*

The TDR probes are placed into the cushion, allowing electrical current to pass between the two probes. This provides a measure of the amount of moisture in the racing surface. For each collection period, TDR probes are placed into the cushion of the Saratoga Main Track to a depth of three inches in no less than five locations, at the 7/8 chute, the 5/8 pole, the 3/8 pole, the 1/8 pole, and the 15/16 pole at three feet, 13 feet, and 24 feet from the inside rail. This provides 15 independent samples from around the entire racing surface. The TDR findings were reported as Percent Volume Moisture Content (%VMC) and were entered into the MQS database to create temporal and spatial plots of variation in the moisture content of the racetrack. This metric provides the actual moisture content of the racing surface, making %VMC a more accurate metric than measuring rainfall data. Individual moisture content readings were taken from the Main Track from July 18, 2023 – September 4, 2023. The minimum %VMC of the Main Track was 6.6 percent and the maximum %VMC was 37.5 percent.

A Mann-Whitney U Test was used to compare the median %VMC of the Main Track during the 2022 and the 2023 Saratoga Meets. The %VMC of the Main Track in 2023 was significantly greater than the %VMC of the Main Track in 2022 ($p<.001$). There were two racing fatalities on the Main Track in 2022 and there were three racing fatalities on the Main Track in 2023.

As mentioned, morning and late afternoon measurements were only taken on race days. A comparison of the %VMC in the morning was made with that of late afternoon measurements. Although on some days there were differences between the morning and afternoon measurements, there was

no difference between the median %VMC in the morning and afternoon measurements. Overall, the median moisture content for both the morning and evening measurements was the same (14.9 percent) and the temporal variation of morning and afternoon percent volume moisture content was similar. There was temporal variability in the moisture content of the dirt racetrack within hours on some race days. See **Figure 14**.

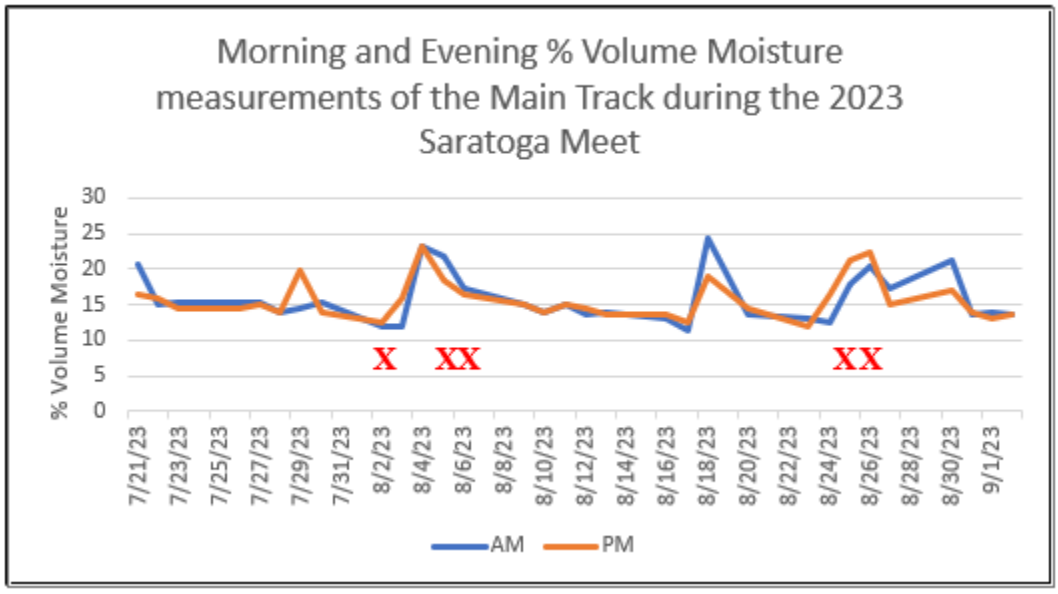

***Figure 14**. The Percentage Volume Moisture Content (%VMC) of the Main Track was measured each morning before and each afternoon after racing. Each of these data points represent the median of 15 individual measurements obtained in the morning and the afternoon. Days when fatal musculoskeletal injuries occurred on the Main Track are indicated by an X. Note that FMSI also occurred on July 15, 2023 and July 20, 2023, but no %VMC data was recorded for those days.*

a. Variability of Moisture in the Main Track

Viewed from a different perspective, all 15 individual %VMC measurements obtained from the Main Track during morning and evening measurements are represented in **Figure 15** below. By portraying *individual* measurements instead of charting a calculated central value for each day, the box and whisker plot provides greater detail regarding both temporal and special variability of the moisture in the Main Track. The blue boxes in **Figure 15** below represent the central 50 percent of the individual measurements for each sampling time. The whiskers represent the minimum and maximum values for that sampling time. The vertical length of the blue box indicates the degree of variability among the values obtained for that sampling time. Smaller boxes indicate minimal variation among the data points while larger boxes indicate a

greater degree of variation among the data points for each sampling time.

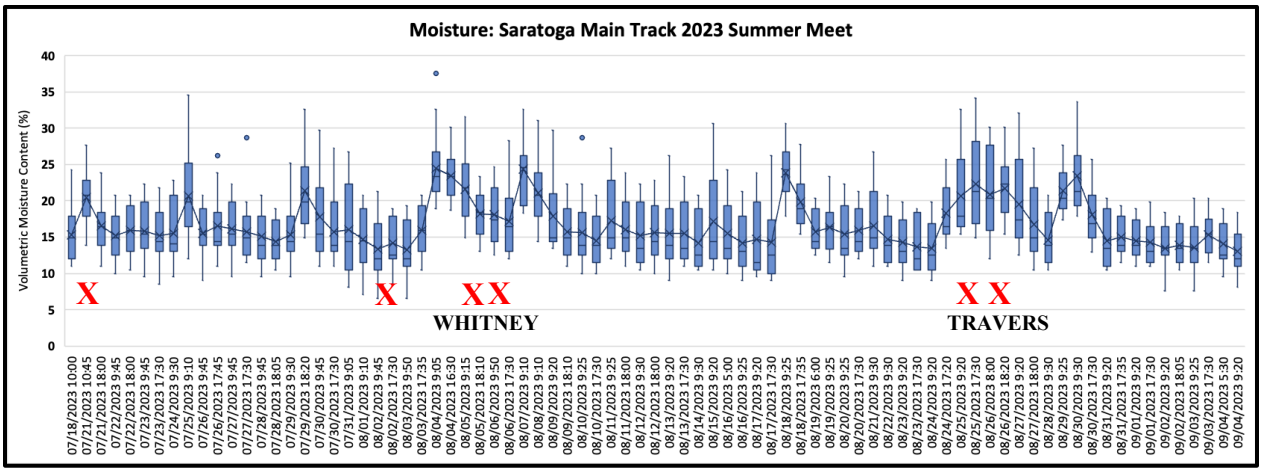

Figure 15*. Box and whisker plot of the daily moisture content (%VMC) of the Saratoga Main Track throughout the 2023 Saratoga Meet. The symbol X represents days in which fatal musculoskeletal injuries occurred on the Saratoga Main Track. One FMSI occurred on July 15, 2023, a day in which no moisture measurements were obtained.*

i. Temporal Variability of Moisture in the Main Track

From the period of July 18, 2023 – September 4, 2023, the median %VMC of the Saratoga Main Track was 16.81 percent. During the Meet there were two clusters of CMSI in which three FMSI occurred in a two-day period. The first cluster occurred within a five-day period that included the Whitney Stakes, with one FMSI on August 2, 2023, one FMSI on August 3, 2023, one FMSI on August 5, 2023 and two FMSIs on August 6, 2023. The second cluster of FMSI occurred during the weekend of the Travers Stakes, with one FSMI on August 25, 2023 and two FSMIs on August 26, 2023. The median %VMC of the Main Track for these four days was 20.06 percent. The median %VMC of the Main Track for days of the Meet in which no FMSI occurred was 15.4 percent. Six of the 12 exercise-associated FMSI (50 percent) occurred in these five days when the median moisture content of the Main Track was increased by 20 percent above the median %VMC for the entire Meet. There were two days during the Meet when two FMSIs occurred on the same day (August 6, 2023 and August 26, 2023). The %VMC of the Main Track on those days was 17.57 percent and 21.28 percent respectively.

The median %VMC of the Main Track was higher on days in which FMSI occurred (16.9 percent) than in days when there

were no FMSI (15.4 percent). However, that difference was not statistically significant when the data was analyzed using the Mann-Whitney U test (P=0.121).

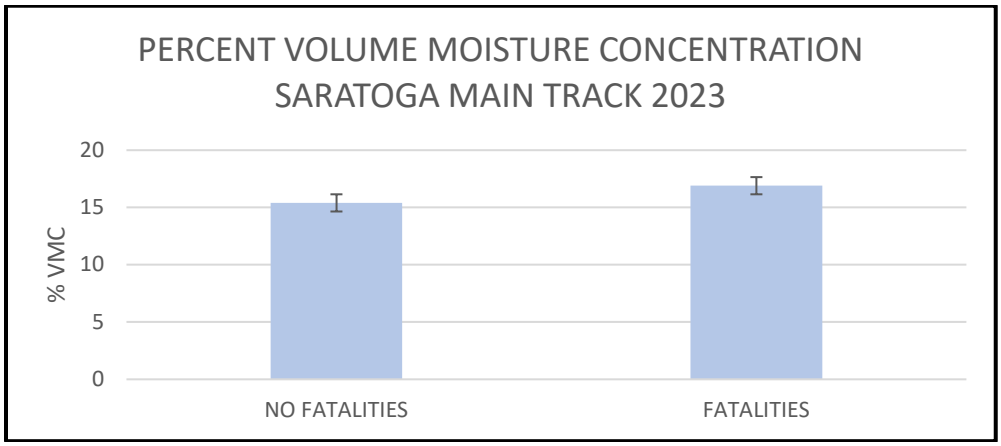

***Figure 16**. The median %VMC of the Saratoga Main Track for days of the 2023 Saratoga Meet in which fatal musculoskeletal injuries occurred compared with the %VMC of the Saratoga Main Track when no fatal musculoskeletal injuries occurred.*

When %VMC of the Main Track is graphed for the days leading up to the Whitney and Travers Stakes, there is a positive trend line for increasing moisture content in the racing surface leading up to the feature races in which the FMSI occurred.

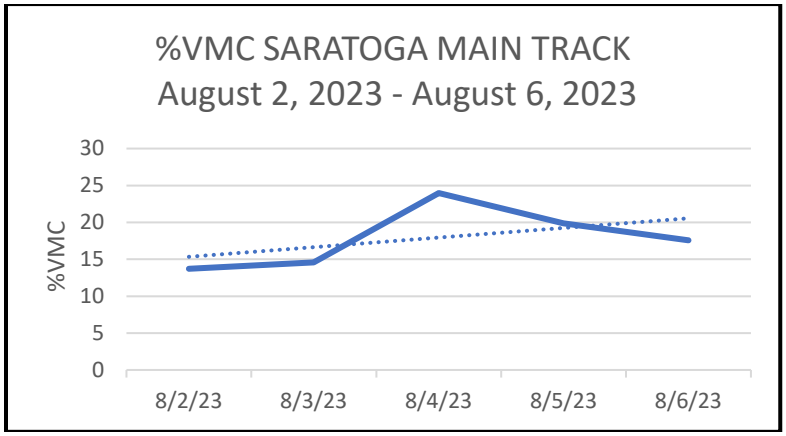

***Figure 17**. Percent volume moisture content (%VMC) of the Main Track in the days leading up to Whitney Day (August 6, 2023) during the 2023 Saratoga Meet. The dotted line is a positive trend line that represents accumulation of moisture in the racing surface leading up to the feature races on August 6, 2023.*

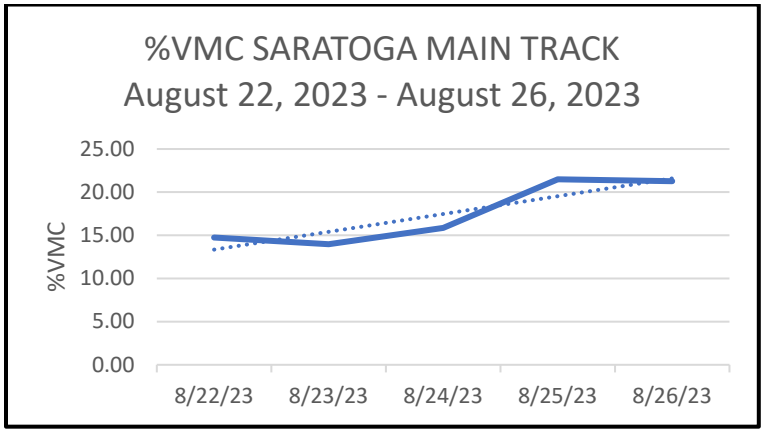

***Figure 18**. Percent Volume Moisture Content (%VMC) of the Main Track in the days leading up to Travers Day (August 26, 2023) during the 2023 Saratoga Race Meet. The dotted line is a positive trend line for increasing moisture content of the track in the days leading up to the feature races on August 26, 2023.*

ii. Spatial Variability of Moisture in the Main Track

Spatial variability of the %VMC around the Main Track was determined by obtaining moisture measurements of the racing surface 3 feet, 17 feet, and 24 feet from the inside rail of the racetrack at five locations around the racing oval as indicated in **Figure 19** below.

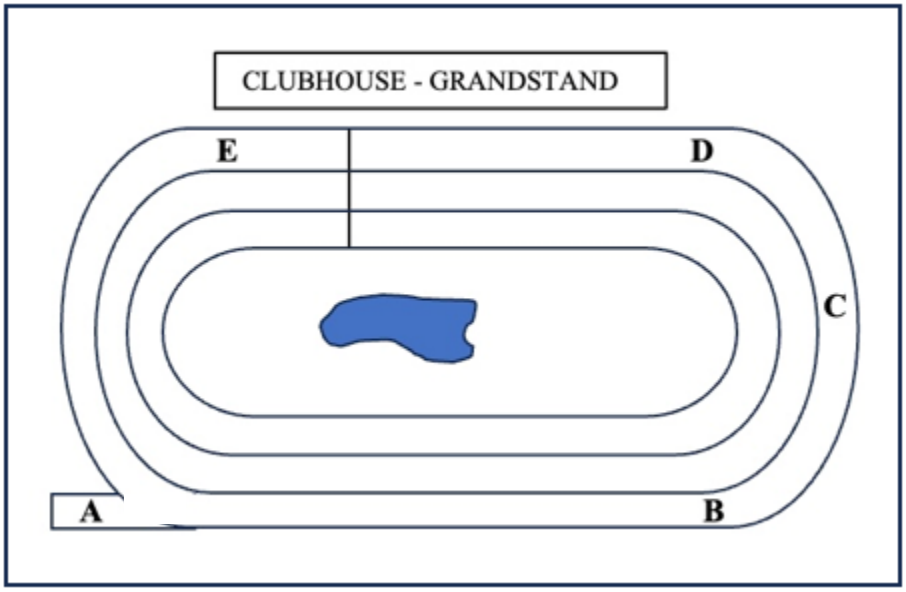

***Figure 19**. Percent VMC was measured at five locations around the Saratoga Main Track. Samples were obtained at (A) the 7/8-mile chute, (B) the 5/8-mile pole, (C) the 3/8-mile pole, (D) the 1/8-mile pole and (E) the 15/16-mile pole.*

b. Combined Temporal and Spatial Variability of Moisture in the Main Track

While there was similar spatial variability of the %VMC at these five locations around the Main Track on days of the Meet in which there were no FMSI (Control %VMC), there was increased variability of the %VMC on the days in which the two clusters of fatalities occurred (Whitney & Travers) as indicated in **Table 4** below.

Locations of %VMC Measurement	Control %VMC	Whitney Cluster %VMC	Travers Cluster %VMC
7/8 Mile Chute	12	14.9	16.0
5/8 Mile Pole	13.6	15.6	17.2
3/8 Mile Pole	17	19.5	22.6
1/8 Mile Pole	15.1	16.9	23.6
15/16 Mile Pole	21.3	21.3	28.8

***Table 4**. Percent VMC at five locations around the Main Track at the time of the Whitney Fatality Cluster and the Travers Fatality Cluster compared to days when there were no FMSI.*

In general, the %VMC was higher in the front stretch of the Main Track than in the back stretch. During the cluster periods, the median %VMC at these locations was 23 percent higher than the days of the Meet in which there were no FMSI.

Logistic regression was performed to compare risk for injury with the %VMC at five locations around the racetrack on days in which the two clusters of FMSI occurred (August 2- August 6 and August 25 - August 26) compared with the days of the Meet in which no FMSI occurred. There was a positive correlation between %VMC and FMSI during the Whitney and Travers clusters compared to control days in which no fatalities occurred during the 2023 Race Meet ($p<.001$).

The increased risk for injury was not equally distributed among the five locations around the racing surface. Using the 7/8-mile chute as a reference, there was a significant difference in moisture content at the 5/8 pole, the 1/8-mile pole and the 15/16-mile pole compared to the 7/8-mile chute during the Whitney and Travers cluster periods. There was no significant difference between the %VMC at the 3/8 pole compared to the %VMC at the 7/8-mile chute during the Whitney and Travers cluster periods.

Location Comparisons of %VMC	Risk for injury	Significance
7/8 Mile Chute – 5/8 Mile Pole	Increased risk for injury	P = 0.0315
7/8 Mile Chute – 3/8 Mile Pole	No increased risk for injury	P = 0.069
7/8 Mile Chute – 1/8 Mile Pole	Increased risk for injury	P = 0.013
7/8 Mile Chute – 15/16 Mile Pole	Increased risk for injury	P = 0.002

***Table 5**. The probability for equine fatal musculoskeletal injury varied among five different locations on the Saratoga Main Track during the 2023 Meet.*

All five racing FMSI that occurred on the Saratoga Main Track occurred in the front stretch of the racetrack between the 1/8-mile pole and the 15/16-mile poles.

2. Inner & Mellon Turf Courses:

The daily moisture content of the Inner and Mellon turf courses was measured at six locations around each racing surface, using buried electronic sensors. From the period of July 13, 2023 - September 4, 2023, the median %VMC of the Saratoga turf courses was 27.9 percent, with a range of 26.5 percent to 31.1 percent. The moisture content of a turf track is expected to be greater than that of a dirt racetrack due to the obvious differences in the composition of the surfaces and the fact that it is not possible to seal a turf racetrack to prevent moisture from penetrating into the surface during inclement weather. Three of the five turf FMSI (60 percent) occurred when the moisture content of the turf courses was greater than the median %VMC for the Meet.

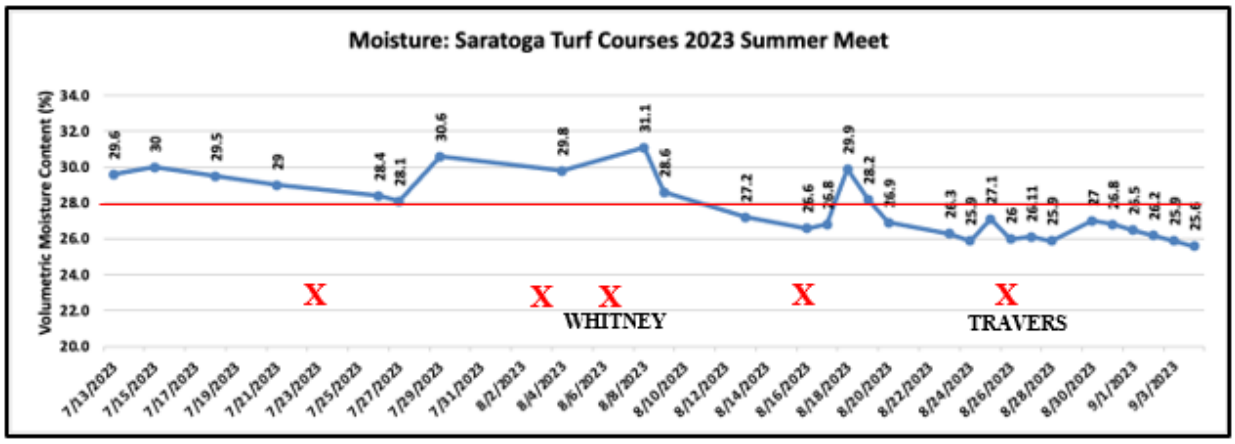

***Figure 20**. Moisture content (percent volume) of the Saratoga Turf Courses throughout the 2023 Saratoga Race Meet. The symbol X represents days in which catastrophic musculoskeletal injuries occurred on turf courses. The horizontal red line represents the median %VMC of the turf courses (27.9%) for the Meet.*

It was not possible to determine the degree of spatial variability of moisture in either of the turf courses during the 2023 Saratoga Meet as

was done for the Main Track because individual measurements around the turf courses were not archived. The average of all 12 sensor measurements (seen in figure 20 above) was used to determine an appropriate irrigation schedule for the turf courses.

3. Additional Proxy Measures

A. Surface Changes

Surface changes occur on days in which racing officials determine that racing on the turf is likely to cause an unacceptable amount of damage to the turf surface, a condition usually found following a period of extreme rainfall. Races scheduled to be run on the turf are taken off the turf course and run on the Main Track, hence the term "surface change." Because of the strong correlation between surface changes and inclement weather, the number of surface changes can serve as a "proxy measure" of the amount of moisture in a turf course.

There was an unprecedented number of surface changes during the 2023 Saratoga Meet. Sixty-five races were taken off the turf and raced on the dirt. The average number of surface changes during the Saratoga Race Meet in the three-year period leading up to the 2023 Saratoga Meet was 31. There were 17 surface changes during the 2022 Saratoga Meet. There were only three racing fatalities (two on the dirt and one on the turf) during the 2022 Race Meet compared with nine racing fatalities (three on the dirt and six on the turf) in 2023. The number of surface changes during the 2023 Saratoga Race Meet represented a 110 percent increase over the average number of surface changes over the previous three years and a 282 percent increase from 2022.

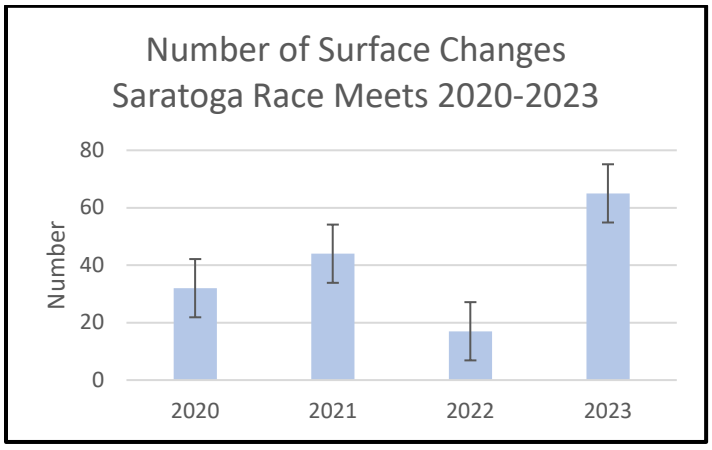

***Figure 21**. The number of surface changes (races taken off the turf due to inclement weather conditions) at Saratoga 2020 - 2023.*

B. Voidable Claims

The criteria used to determine if a racehorse is fit to race in New York is American Association of Equine Practitioners Grade 2 lameness.[b]

If a racehorse is found to have an AAEP Grade 2 lameness during a pre-race inspection, the horse will be scratched. All horses that enter a New York Thoroughbred racetrack starting gate have been determined to be fit to race using this criterion.

In 2020, the Commission amended its voidable claim rule to require all claimed horses to report to the State test barn after the race and be examined by a regulatory veterinarian for soundness. If the claimed horse is found to be unsound using the AAEP Grade 2 lameness criterion, a claimant may void their claim and the horse will be returned to the trainer who entered the horse to race. Because the same criteria (AAEP Grade 2 Lameness) is used to determine lameness before and after the race, and no horse is allowed to race in New York if an AAEP Grade 2 lameness is present prior to the race, if a horse is found to be AAEP Grade 2 lame after the race, it is reasonable to conclude that the change in soundness resulted from the effort made by the horse during that race.

Although only one of the horses that experienced exercise-associated FMSI during the 2023 Saratoga Race Meet was eligible to be claimed, the number of voidable claims during the 2023 Saratoga Race Meet (45) was the highest number since 2020 when the Commission established the voidable claims rule. Comparatively, there were 21 voidable claims during the 2020 Saratoga Race Meet, 29 during 2021, and 18 during 2022. When controlled for the total number of horses claimed during this four-year period, 45 of 321 claims (14 percent) were voidable in 2023, 18 of 312 claims (6 percent) were voidable in 2022, 29 of 297 claims (10 percent) were voidable in 2021, and 21 of 199 claims (11 percent) were voidable in 2020.

[b] AAEP Grade 2 Lameness: Lameness is difficult to observe at a walk or when trotting in a straight line but consistently apparent under certain circumstances (e.g. weight-carrying, circling, inclines, hard surface, etc.).

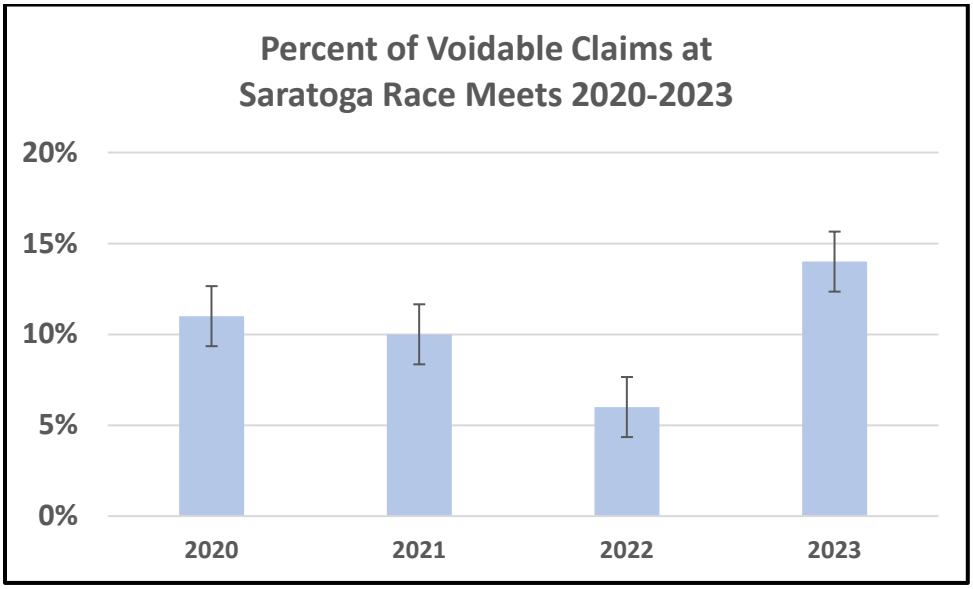

***Figure 22**. The percentage of voidable claims at Saratoga Race Course 2020-2023.*

The percentage of voidable claims during the 2023 Saratoga Race Meet was 56 percent greater than the average of the previous three years. The relative increase of the percentage of voidable claims during the 2023 Saratoga Race Meet compared with the previous three years suggests that the condition of the race track (likely related to unprecedented volume and temporal variability of moisture during the Meet) may have been a contributing collective risk factor for injury.

C. Horses New to Saratoga

As mentioned previously, the Saratoga Race Meet is a “boutique” race meet with unique risk factors. The racing schedule is filled with high purse races that attract horses from throughout the United States and overseas. Horses that ship-in to race at Saratoga that do not have time to train over the Saratoga surfaces prior to racing are at increased risk for injury. Five of the 12 horses (42 percent) that experienced a FMSI while training or racing during the 2023 Saratoga Meet, were injured during their first time out on the Saratoga Main Track.

XI. The Metacarpophalangeal (Fetlock) Joint

The fetlock joint is a unique joint in the distal forelimb of the horse. At rest, the fetlock joint is maintained at a normal angle of approximately 150 degrees when viewed from the side (see **Figure 23** below).

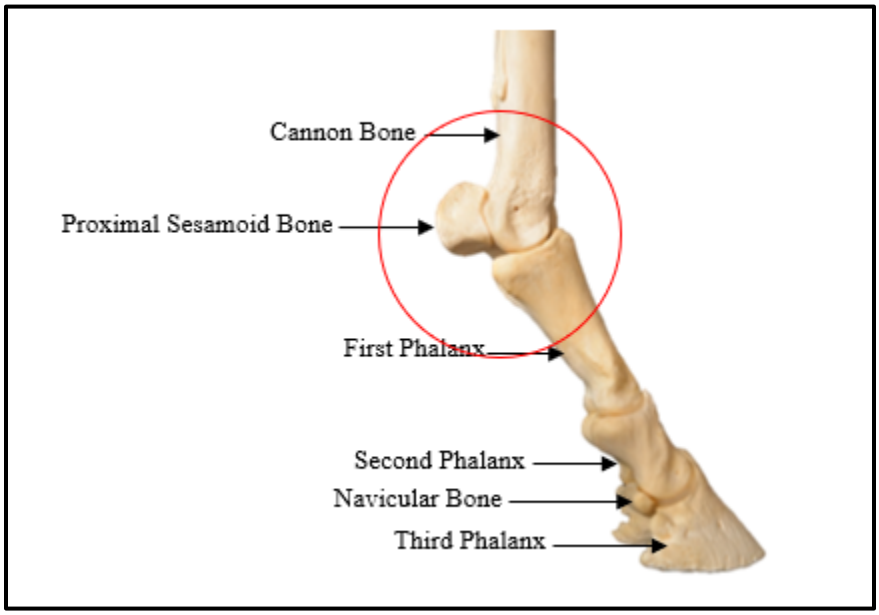

***Figure 23**. The bones of the fetlock joint include the distal (bottom) portion of the cannon bone, two proximal sesamoid bones and the first phalanx (P1). (Illustration by Scott E. Palmer)*

The normal angle of the fetlock joint is maintained by the support of muscles, flexor tendons and a group of ligaments found along the palmar (back) surface of the limb that is commonly referred to as the suspensory apparatus. The proximal sesamoid bones are imbedded within the suspensory apparatus. During high-speed exercise and as the horse rotates over this limb, the fetlock is loaded and compressed into the cushion of the racing surface by forces greater than the horse's body weight (see **Figure 24** below). One force plate study of Thoroughbred racehorses galloping under saddle found peak vertical ground reaction forces equaling 1.0 to 1.7 times body weight (1,100 to 1,870 pounds), depending upon the speed at which the horse was galloping.[14]

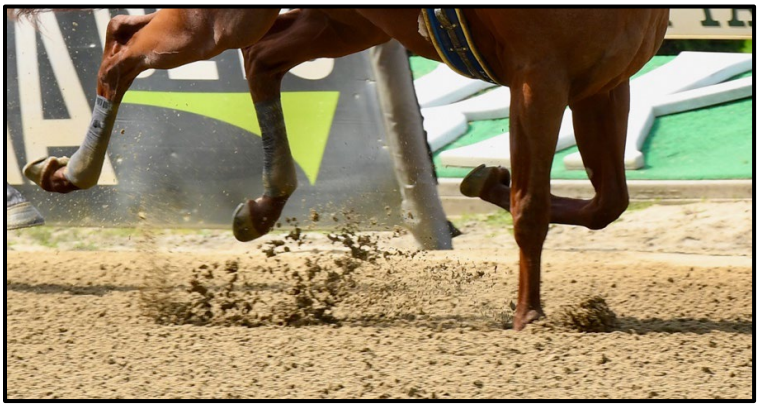

***Figure 24**. The fetlock is fully loaded while being compressed into the cushion of the racetrack during the forelimb stance phase of the stride. (Photograph by Scott E. Palmer)*

As the fetlock joint is placed under maximum load in the cushion of a dirt racetrack (represented by the tan horizontal shaded area in **Figure 25** below), compressive vertical forces (red arrow) hyper-extend the joint and place the suspensory ligaments (represented here as blue arrows) and the proximal sesamoid bones under extreme tension. If this combination of forces causes the sesamoid bones to fracture and/or disrupts the suspensory apparatus, complete failure of the fetlock joint is the result.

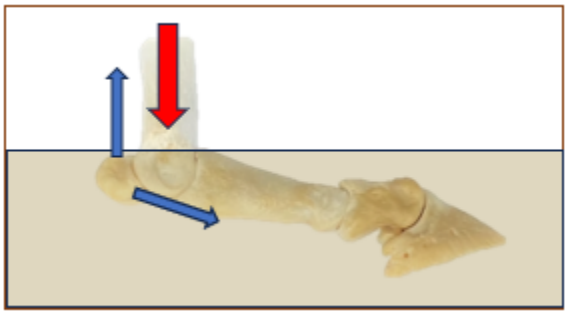

***Figure 25**. Hyper-extension of the fetlock joint during compressive loading places the proximal sesamoid bones and the suspensory apparatus under tension. (Illustration by Scott E. Palmer)*

While repetitive cyclic loading of the horse's skeleton is known to model (strengthen) it when coupled with appropriate periods of rest between those workouts, excessive workload without rest results in mal-adaptive changes in the skeleton and supporting soft tissue structures that can lead to injury. Simple, closed, non-displaced fractures of the fetlock joint are routinely treated with rest and external fixation with a splint or cast or by placing screws across the fracture line. Displaced fractures are best treated with internal fixation, using screws or a combination of screws and plates to achieve anatomic reduction of the fracture fragments. Provided the joint surfaces are not severely damaged, horses with surgical repair of fetlock fractures have a good prognosis for a successful return to racing or may be used for other athletic careers. More complicated fractures, accompanied by disruption of the tendons and ligaments

that support the joint, may result in a failure of the suspensory apparatus to support the fetlock joint in its normal position. In cases of closed fracture with minimal soft tissue injury, surgical arthrodesis (fusion) of this joint may be used to fix the fetlock in its normal angle in an effort to save the horse's life and achieve pasture soundness. Unfortunately, if the fracture is open and contaminated by the racing surface or if accompanying soft tissue injury destroys the blood supply to the limb, the prognosis for recovery is poor and humane euthanasia is indicated.

FMSI of the fetlock joint are the most common cause of exercise-associated Thoroughbred fatalities in the United Sates. In one report, fetlock injuries at New York Thoroughbred racetracks (2013 - 2015), represented 48 percent of the total number of FMSI.[15] In a California study FMSI of the fetlock joint comprised 50 percent of total injuries.[16] Ten of the 12 exercise-associated FMSI (83 percent) that occurred during the 2023 Saratoga Meet were the result of articular fractures within the fetlock joint. One horse experienced a fracture of the distal cannon bone that did not involve the fetlock joint surface and the other experienced a soft tissue injury (suspensory ligament avulsion) that resulted in a total structural failure of the fetlock joint. In all 11 of the 12 exercise-associated FMSI were the result of a complete failure of the fetlock joint. This is a disproportionate (approximately twice the historical average) representation of fetlock injuries in the exercise-associated FMSI that occurred during the 2023 Saratoga Meet. Five of the six horses that experienced a failure of the fetlock joint on the Main Track did so in the final furlongs of the race or while galloping out after the finish line. This commonality of fracture type and injury locations suggests that fatigue was likely a contributing factor for these injuries.

XII. Summary and Conclusions

The total number of equine fatalities at the Saratoga Race Course in 2023 was not significantly different than that of the previous five years. However, the number of *racing* fatalities in 2023 (9) was sharply increased from that of 2022 (3). The following summarizes the significant findings of this review to better understand the reasons for the increased number of *racing* fatalities that occurred in 2023:

A. Summary of Findings

- Of the 17 equine fatalities that occurred at the Saratoga Race Course in 2023, the majority (13) were exercise-related. Among the exercise-related fatalities, nine occurred during racing and four occurred during training hours.
- Although horses racing in claiming races are considered as a group to be a class of horses at increased risk for FMSI, only one of the 13 exercise-associated fatalities occurred in a claiming race.
- The incidence rate of racing fatalities increased from that in 2022 while the incidence rate of training fatalities decreased from that of 2022.
- Twelve of the 13 exercise-related fatalities resulted from musculoskeletal injuries. One exercise-related fatality resulted from a cardiovascular incident. No fatalities occurred on the Oklahoma training track.
- Nearly all exercise-associated fatal musculoskeletal injuries involved fracture and/or dislocation of the fetlock joint. While fetlock FMSI typically represent approximately 50 percent of all FMSI in New York Thoroughbred racehorses, these injuries were over-represented in the exercise-associated FMSI that occurred during the 2023 Saratoga Meet (92 percent) and are associated with repetitive cyclic fatigue combined with extreme hyper-extension of the fetlock joint.
- All *racing* FMSI that occurred on the Main Track occurred in the front stretch of the racetrack during the final furlongs of the race or while galloping out after the race, suggesting that fatigue was a contributing factor.
- All *racing* FMSI on the turf courses occurred as the horses were entering the turn, in the turn or coming out of the turn. Three of the five turf FMSI (60 percent) occurred when the moisture content of the turf courses was greater than the median %VMC for the Meet (27.9 percent).
- Exercise-related fatalities were not randomly distributed throughout the Meet with nine of the 13 exercise-associated injures (69 percent) clustered together in week four and week seven of the Meet. There were five FMSI in a five-day period (August 2, 2023 – August 6, 2023) that included the Whitney weekend and four FMSI in a four-day period (August 23, 2023 - August 26, 2023) that included the Travers weekend.
- A total of 9,164 official timed workouts were completed on the Oklahoma dirt and turf surfaces with no FMSI.

- The sustained rainfall throughout the 2023 Saratoga Meet made it difficult to maintain a consistent racing surface. Both temporal and spatial variability of the moisture content of the Main Track was evident throughout the Meet.
- Although the median moisture content of the Main Track during the 2023 Saratoga Meet was higher on days when there were exercise-associated FMSI, than on days when there were no exercise-associated FMSI (temporal variability), that difference was not statistically significant.
- However, there was a statistically significant correlation between the moisture variability among five locations around the racetrack (spatial variability) and risk for FMSI.
- The most significant degree of spatial and temporal variability of the moisture content of the Main Track occurred at the time of the Whitney and Travers injury clusters.
- The front stretch of the Main Track had a higher moisture content than the back stretch. All *racing* fatalities on the Main Track occurred in the front stretch of the racetrack, either before the wire or after the wire as the horses were pulling up.
- All turf fatalities occurred in transitions to the turns or in the turns themselves. Although no individual moisture measurements were available for the turf tracks during the 2023 Race Meet, the unprecedented number of surface changes during the Meet provides an additional metric to substantiate the finding of increased temporal moisture content of the turf surfaces during the Meet.

B. Conclusions

Multiple individual horse risk factors and collective risk factors contributed to increased risk for FMSI of horses during the 2023 Saratoga Meet. Some of these factors are modifiable while others are not. Some have a greater priority than others. For example, research studies have found a strong association between a horse being on the Veterinarian's List and FMSI. Even after coming off the Veterinarian's List, these horses maintain an increased risk for FMSI.[11] Closed Caption experienced a FMSI while training on the Main Track while she was on the active Veterinarian's List in another State. Risk factors are additive. The more risk factors that apply to an individual horse, the greater that horse's risk for injury.

Collective risk factors apply to all horses. Racing at a boutique meet such as Saratoga is an example of a collective risk factor. Many horses ship-in to Saratoga from other jurisdictions to train and race in a compressed time frame with signature races scheduled far in advance of the Meet. The unique opportunity to compete in historic prestigious races with a high purse structure incentivizes risk. For example, it was apparent from the history of repeated regulatory veterinary interventions and a history of multiple intra-articular injections that New York Thunder was a horse whose career was managed in a manner to enable him to race during the Saratoga Meet despite evidence of significant unresolved musculoskeletal injury. This pattern of racehorse career

management is consistent with prioritizing entry in a boutique meet ahead of concern for the welfare of the horse.

The most significant collective risk factor during the 2023 Saratoga Meet was the spatial and temporal variability in the moisture content of the racing surfaces, particularly during week four and week seven of the Meet. While many horses were able to safely negotiate an inconsistent racing surface, some were not, particularly those horses with cumulative individual horse risk factors.

There are conflicting research findings regarding the potential for racetrack surface condition to be a contributing factor for FMSI. Although rainfall is an obvious variable that contributes to the amount of moisture in the racetrack, there was no correlation between daily rainfall events and FMSI during the 2023 Saratoga Meet. Meet-to-meet comparison of average rainfall during a race meet is of limited value because it fails to account for the temporal and spatial variability of the moisture in the racing surface.

Percent Volume Moisture Content (%VMC) is the more appropriate metric to analyze to test for an association between moisture in a dirt track and FMSI.

Although the median %VMC of the Main Track was not significantly higher on days when FMSI occurred than on days in which no FMSI occurred, there was significant spatial variability of the %VMC when measured at five different locations around the Main Track. Logistic regression analysis of this data found a correlation between spatial variability of the %VMC in the track and increased risk for injury. This finding underscores the significance of spatial variability of moisture content of the racetrack as a risk factor for FMSI. Ironically, median moisture data alone, by its very nature, cannot define spatial variability.

Moisture in the surface of the racetrack is a function of the moisture applied to the surface by water trucks or by rainfall, the absorptive properties of the surface composition, drainage and evaporation. Evaporation is a function of sunlight (heat) and air movement over the surface (wind). The sun and wind shadow provided by the Saratoga grandstand and clubhouse over the front stretch of the Main Track compromises the ability of the racing surface to eliminate water by evaporation. This is a very-well documented phenomena. This is likely the reason that the %VMC of the front stretch of the Main Track was higher than the backstretch. There is no sun or wind shadow effect on the backstretch. The backstretch receives full sun throughout the day and there are no structures in that area to block the wind.

The relative increased moisture content in the front stretch of the Main Track, coupled with the fatigue associated with the effort required to finish the race likely contributed to increased risk for FMSI on the Main Track.

Temporal variability of the %VMC of the Inner and Mellon Turf Courses was also evident during the 2023 Saratoga Meet. Three of the five turf FMSI (60 percent) occurred when the moisture content of the turf courses was greater than the median %VMC for the Meet. Unfortunately, the data from the individual sensors embedded under the turf courses were not archived in the same manner as was done for the Main Track, making it impossible to determine if there was spatial variability of the %VMC around the entire racing surface. However, it is interesting to note that a commonality of the turf fatalities during the Saratoga Meet was that they all occurred in the turns or as horses were entering or leaving the turns. At those locations horses and jockeys must deal with centrifugal force, a force vector that is not present in the straightaways. It is possible that the increased moisture of the turf courses *may have* made it more difficult for horses to safely negotiate the turns than would have been the case in dry conditions.

It is important to note that rainfall and moisture content of the racing surface data is not normally distributed over time. It is non-parametric data. For that reason, use of non-parametric tests such as the Mann-Whitney U Test should be used for statistical analysis of this data, rather than traditional parametric statistical tests.

Racing analysts have speculated that the decrease in racing handle at Saratoga in 2023 was the result of inclement weather. The extraordinary number of surface changes (65) resulted in smaller and less-competitive fields. This contributed to a nine percent decrease in the all-sources handle in 2023.[17] The all-sources handle for the 2022 Saratoga Race Meet was $878,211,923.00. The all-sources handle for the 2023 Saratoga Meet $799,229,288.00. Viewed strictly from this wagering perspective, the financial impact of the persistent inclement weather at Saratoga in 2023 was $78,928,675.00.

Risk management is the key to reducing equine fatalities. Over the past 14 years New York Thoroughbred racetracks have successfully implemented targeted interventions to mitigate risk for equine fatalities. Over this period, the number of equine fatalities at New York Thoroughbred racetracks has been reduced by 54 percent.[18] The recommendations contained in this report are intended to supplement the New York Thoroughbred risk management program currently in place.

XIII. Recommendations

Since the conclusion of the 2023 Saratoga Race Meet some of the recommendations in this Report have been completed or partially addressed. Others are presented for consideration. The present status of each Recommendation is included in this summary.

A. Racing Surface Recommendations

1. Classification of the Racing Surfaces

Concern: Moisture content of the racing surface is the most important modifiable component of both dirt and turf racetracks. Although the classification of a racing surface is fundamentally a matter of relative moisture content, objective measurement of the moisture content of the racing surface is not currently used to classify racetrack surface conditions in the United States. Traditionally, racetrack conditions are classified according to subjective impressions by racetrack personnel as described in **Appendix A**. This process lends itself to individual bias and compromises the accuracy of the classification system. It also confounds the ability of researchers to use this subjective classification to investigate the association of changes in the surface condition with FMSI. At NYRA racetracks technology is available to accurately measure the moisture content of both the dirt and turf courses.

Recommendation: NYRA should use objective real-time moisture measurements of the racing surface that are currently available at all NYRA racetracks as the metric for classification of the racing surface.

There is precedent.

The Japan Racing Association (JRA) uses an infrared moisture meter to measure the moisture content of both dirt and turf racetracks. Track surface conditions and the official terms used by the JRA include four grades according to the levels of moisture in the track (shown below in parenthesis).[19]

Turf Courses

Condition	Descriptive	Moisture Percentage
Firm	Dry or slight moisture	<22
Good	Good amount of moisture	23 – 26
Yielding	Very wet course that produces slower racing times	27 – 29

Soft	Water-logged course that produces very slow racing times	>29

Dirt Courses

Condition	Descriptive	Moisture Percentage
Fast	Dry	<10
Good	Some residual moisture	10 – 13
Muddy	Very moist due to high water content	14 – 16
Sloppy	Slippery due to excessive water content	>16

Appropriate moisture percentages will vary from racetrack to racetrack as a function of surface composition of the cushion material, and local environmental conditions. For this reason, the moisture measurements used by the JRA may not be the ones best suited for use at Saratoga and other racetracks in the United States. However, the JRA protocol outlined above most certainly provides a starting point for NYRA racing officials to create an appropriate objective basis for classification of races.

Anticipated Outcome. Use of objective measurements of moisture in the racing surface will improve the accuracy of classification of the racing surface for handicapping purposes and will enable researchers to perform appropriate stratification of fatality data to accurately determine relative incidence of FMSI for differing classifications of racetracks.

Status. To be considered.

2. Improve Moisture Content Measurement

Concern. “If you cannot measure it, you cannot improve it” - William Thomson, 1st Baron Kelvin, 1883.

A consistent racetrack is a safe racetrack. Inconsistency of the racing surface increases risk for FMSI. Horses can adapt to differing racing surfaces over time, but they cannot adapt to inconsistency in the surface at multiple locations within a racetrack. Moisture content is the most critical modifiable component of any racetrack. It can change on an hourly basis and it can change from location to location around a racetrack. Measurement of moisture in the racetrack is an evolving science. Technology was in place at Saratoga racetracks in 2023 to measure moisture in the track at five locations around the Main Track and at six locations around each turf course. However, up until now, the analysis of moisture content of turf and dirt racetracks was limited to use of average data that was analyzed using parametric statistical methods. Averaged

data cannot detect or quantify spatial variability of the moisture content of the racing surface. Analysis of the moisture content of the dirt and racing surfaces during the 2023 Saratoga Meet found that: (a) rainfall and moisture content (%VMC) of the racetracks data is not normally distributed (non-parametric data) and must be analyzed with non-parametric statistical methods; and (b) there was a correlation found between the combination of temporal and spatial variability of the %VMC and FMSI. At this point there is a need for additional prescriptive data to help racetrack management make informed decisions regarding the safety of the racing surfaces, using the metric of spatial and temporal variation of moisture content of the racing surfaces.

Recommendation: In addition to monitoring the median daily moisture content of the Main Track, NYRA should develop a standing operating procedure that will use an additional metric that can accurately determine the degree of spatial and temporal variability of the moisture within both the Main Track and the Turf Courses. Currently, Time Domain Reflectometry (TDR) measurements are being made at more than five locations around the racetrack. Analysis of this data should be performed using non-parametric statistical tests and in real time to identify areas of significant spatial and temporal variability of the moisture content of the racing surfaces. For example, based upon the findings of this report and until further data can be obtained to validate this process, NYRA should consider a 23 percent increase in the variability of the measured %VMC of the Saratoga Main Track over a seasonal base line to be a significant collective risk factor for FMSI. Saratoga turf courses with a water content of 30 %VMC or higher also represent an increased risk for FMSI.

Anticipated Outcome: Use of the novel metrics of the *spatial and temporal variability* of the racing surface will facilitate the development of evidence-based guidelines to help racetrack management make informed decisions to remove races from the turf or even to postpone racing altogether if conditions meet objective criteria that are determined to be unsafe for racing. These determinations will provide racing officials with real-time guidelines for safe racing that will reduce the risk for FMSI.

Status: Improved measurement and analysis of the moisture in the Main Track and Inner and Mellon Turf Courses is being used at the Saratoga Race Course for the 2024 Meet. New standard operating procedures, using improved moisture measurement technology and measurement of moisture at every 1/16 of a mile around the racing surface are now being developed.

3. Re-examine Best Practices for Racetrack Maintenance

Concern. During the 2023 Saratoga Race Meet, the increase in the median %VMC and spatial and temporal variability of the moisture content of the main dirt track likely contributed to the risk for fatal musculoskeletal injury. These injuries occurred despite application of best practices of racetrack maintenance and quality control.

Recommendation. NYRA should support and participate in research efforts to critically evaluate current best practices to achieve improved consistency of the moisture content of the racing surface and to eliminate excessive moisture in the racing surface after persistent and heavy rainfall. For example, on March 24, 2010, Dr. Mick Peterson, Dr. Becky Woodworth, and Dr. Wayne McIlwraith created a research proposal: Churchill Downs Research Initiative: Advanced Water Truck.[20] This proposal aimed to develop a "smart" watering truck that would measure moisture in the track surface and apply water to those areas in need of water and not in areas that did not need additional water, using control technologies, GPS data fusion and system integration. This proposal was not funded at that time. A more current proposal that incorporates advancements in the field over the past 14 years should be considered for current funding. Another potential innovative track maintenance device for consideration could be a propane heater attached to a harrow that could be used to dry a dirt racetrack that has been saturated with water over a period of days.

Anticipated Outcome. NYRA should participate in research practices. Innovative and creative new equipment and best practices should be developed to minimize the accumulation, retention and the spatial and temporal variability of the moisture content of a racetrack.

Status. To be considered.

4. Additional Monitoring of Racing Surface Composition

Concern. The composition of a dirt racetrack is a mixture of approximately 85 – 90 percent sand and 10 – 15 percent silt and clay. Silt and clay are considered "fines" as they represent the relatively small particles of material that mix with the sand to maintain consistent surface tension of the racetrack. Currently, a particle size distribution analysis is performed on the racetrack prior to the opening of the meet. Sampling is currently not repeated during the meet, and the potential for inclement weather to either remove or redistribute the fine materials of the racetrack exists.

Recommendation. Perform serial Sieve Hydrometer Particle Size Distribution testing and Laser Diffraction Particle Size Distribution testing on all NYRA dirt racetracks, the first test to be performed prior to opening the track for training and/or racing and again in the event of unusual

inclement weather or a cluster of equine fatalities at any time during the meet.

Anticipated Outcome. Real-time serial testing of the composition of the racing surface will detect loss or segregation of fine materials in the cushion of the racetracks due to weather and or horse usage over time. If needed, additional appropriate material can then be added to the surface to decrease the risk of injury during a race meet.

Status. To be considered.

5. Consideration of a Synthetic Surface at Saratoga

Concern. The degree of inclement weather during the 2023 Saratoga Race Meet had a profound negative impact upon the safety of racehorses and confounded the ability of NYRA to complete its full racing program. Sixty-five surface changes during the 2023 Saratoga Meet disrupted much of the turf racing schedule. In many cases field size was severely compromised as the result of these surface changes with commensurate decrease in handle. Despite the use of extraordinary efforts and use of best practice racetrack surface management, it was extremely difficult to maintain safe and consistent racing surfaces.

Recommendation. Install a synthetic racing surface at Saratoga Race Course.

Anticipated Outcome. Decades of research have definitively shown that well-constructed and well-maintained synthetic surfaces will significantly reduce the incidence of FMSI of Thoroughbred racehorses. While the evolution of a robust iterative safety program in New York has significantly reduced Thoroughbred fatalities, this iterative racing risk management program is ever-evolving. Having the option of a synthetic surface at Saratoga will help to reduce the risk for exercise-associated musculoskeletal injury and provide a safe alternative surface when races are taken off the turf. This will reduce the number of horses that scratch from turf races during inclement weather, improve field size and increase the overall handle.

Status: To be considered.

B. Veterinary Services Recommendations

1. The Increased Role of the Attending Veterinarian

Concern. There is increased risk for injury when Thoroughbred racehorses perform high-speed exercise (official timed workouts and

racing). At the time of the 2023 Saratoga Meet there were no requirements for horses to be examined by attending veterinarians prior to high-speed exercise. Attending veterinarians, by virtue of their frequent contact with the horses in their care, have a more intimate knowledge of each horse's condition and their medical care than do regulatory veterinarians. Requiring attending veterinarians to examine horses prior to high-speed exercise will provide an additional layer of veterinary scrutiny to help identify horses that may be at increased risk for injury prior to performing high-speed exercise.

Recommendation. Create a requirement (NYRA house rule & Commission rulemaking) that will require examination of horses by their attending veterinarian prior to high-speed exercise as follows:

a. All Thoroughbred horses must be examined by their attending veterinarian between 72 and 24 hours of a race.

b. All Thoroughbred horses that are currently on the Veterinarian's List or have ever been placed on the Veterinarian's List due to unsoundness must be examined by their attending veterinarian within 72 hours of attempting an official timed workout (breeze) for as long as that horse remains in active training.

The findings of these examinations must be reported to the Chief Regulatory Veterinarian of the Racetrack prior to the day of the scheduled official timed workout or race.

If this requirement was in place during the 2023 Saratoga Meet, every one of the horses that experienced an exercise-associated FMSI would have had increased veterinary scrutiny prior attempting high-speed exercise.

Anticipated Outcome. Implementation of this recommendation will increase veterinary scrutiny of Thoroughbred racehorses prior to high-speed exercise and aid in the identification of horses at increased risk for injury. This will help to reduce the incidence of fatal musculoskeletal injuries of Thoroughbred racehorses during races and official timed workouts.

Status. NYRA now has a house rule that requires attending veterinarians to be examined between 72 hours and 24 hours of a race. In 2023, the Commission proposed rulemaking to require examinations of horses by attending veterinarians prior to racing and training. This proposal was withdrawn in response to multiple concerns expressed by racing stakeholders. The rule was amended to address those concerns and will be re-introduced in 2024.

2. National Risk Factor Database

Concern. Individual horse risk factors are not uniformly distributed among the racing population. Risk for injury increases proportionally to the accumulation of multiple risk factors. Identification of individual horse risk factors in Thoroughbred racehorses prior to performing high-speed exercise is an important but time-consuming process. Current workday requirements for NYRA regulatory veterinarians do not provide adequate time to identify and efficiently review the exercise history and other individual horse risk factors prior to entry of racehorses at NYRA racetracks on a daily basis.

Recommendation. HISA currently collects a wide range of individual horse data into a national database. This data can be used to generate an epidemiologic risk factor report that will quantify risk for individual horses. HISA currently provides a daily risk factor summary report to regulatory veterinarians who will perform pre-race inspections on horses entered to race that day. Artificial intelligence (AI) is being used to investigate associations between medication usage and FMSI and attempt to quantify risk by assigning values to each risk factor according to its perceived importance. This is a very important first step designed to enhance the pre-race screening process and protect horses from injury. However, the algorithm used to generate this report must be validated before it can be used with confidence to quantify risk for individual horses. This is an iterative process. First, risk factors are identified, then ranked according to perceived importance, and then compiled for individual horses to quantify risk for FMSI. The next step (validation of the model) is accomplished by monitoring horses over time to see if this risk factor report has positive predictive value. Specifically, this model should be independently tested to see if a high level of risk generated by this model actually is associated with FMSI. Veterinarians with epidemiologic training and experience must participate in this validation effort.

Anticipated Outcome. Horses with increased risk for injury will be given priority for examination by regulatory veterinarians prior to entry. This will increase veterinary scrutiny appropriate proportional to the individual horse's level of risk. This will help to reduce FMSI of Thoroughbred racehorses.

Status. HISA currently provides a comprehensive horse report to NYRA regulatory veterinarians for use in screening horses after entry for races. This report needs to be validated by Regulatory Veterinarians and epidemiology research scientists.

3. Improved Intra-Articular Injection Reporting

Concern. At the time of the 2023 Saratoga Meet HISA reporting requirements for intra-articular injection did not require identification of the joint(s) that was (were) injected. This omission confounds the ability of regulatory veterinarians and investigators to identify repeated joint treatments in a particular joint over time.

Recommendation. Modify the HISA intra-articular injection reporting system so that the individual joint that received the injection is identified. Compare the risk for FMSI among horses with and without intra-articular injections within 30 days of a race.

Anticipated Outcome. This amendment of the intra-articular reporting requirements will help to improve our understanding of the effects of multiple injections of individual joints and to better determine if there is an association between intra-articular injection and FMSI. Additionally, in the case of claiming horses, or race horses that are otherwise sold, this information will provide the responsible party with important medical historical information to ensure appropriate continuity of care.

Status. Modification for the requirement to include the identification of all injected joints is now underway by HISA.

4. Improved Compliance with Medication Reporting Requirements

Concern. A lack of compliance with HISA medication reporting requirements confounds the ability of regulatory veterinarians and investigators to accurately determine the medication history of Thoroughbred racehorses.

Recommendation. Improve compliance for reporting medication usage in Thoroughbred racehorses to HISA by improving the medication portal for convenient and contemporary reporting of all medical treatments to covered racehorses and by enforcing the compliance by responsible persons.

Anticipated Outcome. The administration of medication to Thoroughbred racehorses is based upon a perception of need by trainers and veterinarians, sometimes in consultation with owners or managing partners. There is variation among racing stakeholders about the need for medication of racehorses. Accurate and contemporary recording medical treatment history will be used to reliably determine the frequency and type

of medication being given to racehorses. The medical history will be provided to the successful claimants of claiming horses and the owners of horses purchased by conventional sales. This will help to ensure that an accurate and contemporary medical record will travel with the horse when ownership is transferred. This information will also provide valuable information for regulatory veterinarians and investigators. For example, horses with ongoing musculoskeletal pathology are typically medicated with both disease-modifying and symptom-modifying medications used to control pain and improve joint health and muscle soreness. For this reason, the total number of medical treatments alone and the ratio of systemic pain medication and intraarticular therapy to the total number of medical treatments can provide a proxy measure for horses potentially at increased risk for FSMI. This metric will help to identify horses with early or subclinical musculoskeletal injuries before they become serious or before the horse is placed on a Veterinarian's List.

Status. HISA is aware of the compliance issue. Since the end of the 2023 Saratoga Race Meet, HISA has made substantial progress to improve compliance for reporting medication usage in racehorses. This is an ongoing process.

5. Required Non-fatal Injury Reporting

Concern. Currently there is no requirement to report non-fatal musculoskeletal injuries to HISA. As a result, there is no reliable data available to accurately determine the prevalence of non-fatal musculoskeletal injury.

Recommendation. Create a requirement for responsible persons to report non-fatal musculoskeletal injuries to HISA and provide a convenient and reliable electronic system for the accurate reporting of non-fatal injuries.

Anticipated Outcome. This will provide a sensitive metric to quantify the prevalence of non-catastrophic injury to racehorses. This information could be used in many ways, including research to investigate association of non-catastrophic injury with changes in the condition of the racing surface.

Status. To be considered.

6. Consistent & Standardized Necropsy Conduct and Reporting

Concern. One of the challenges of investigating the injuries of horses that experienced FMSI during the 2023 Saratoga Race Meet was inconsistency in the amount of pertinent detail provided in the necropsy

reports of some horses. This confounded the ability of regulatory veterinarians and investigators to determine if pre-existing musculoskeletal pathology may have contributed to some of the FMSI.

Recommendation. Modify the racing necropsy standard operating procedure for use in horses that perish in New York. The necropsy reports will consistently reflect the appropriate level of detail to determine the presence of pre-existing orthopedic conditions that can predispose racehorses to FMSI.

Anticipated Outcome. Implementation of internal controls to ensure that the necropsy reports are sufficient to document pre-existing musculoskeletal pathology with reporting in a standardized format will enable reliable assessment of risk in horses that experience fatal musculoskeletal injury. This information is important to determine individual horse risk factors to better understand their contribution to the circumstances that contribute to FMSI. This information is also important to share with responsible persons so that they may better appreciate the role pre-existing musculoskeletal pathology in their horses that would otherwise not be possible to identify.

Status. The Department of Anatomic Pathology at Cornell University has modified its Thoroughbred racetrack necropsy reports to be consistent with the current standards adopted by HISA, to include comprehensive reporting of orthopedic pathology that is consistent with pre-existing injury that may predispose horses to fatal musculoskeletal injury. These reports now include anatomic diagrams of the injuries to help better educate trainers about the nature of the injuries to their horses. Additionally, Cornell has provided additional training for their veterinary pathologists so that the degree of detail of their reports will be consistent among individual examiners. Currently, there is also improved monitoring of the individual necropsy reports.

7. Wearable Biometric Sensors

Concern. Over the past decade, use of a robust racing risk management program based largely upon the subjective assessment of the soundness of racehorses by regulatory veterinarians has reduced the incidence of equine fatalities at New York racetracks by nearly 50 percent. Objective data to identify horses with subclinical lameness that is not detectable by subjective inspection is needed. A clinical trial of wearable accelerometer-based inertial measurement unit sensors was conducted at NYRA racetracks in 2021 and 2022 and are now being conducted at Kentucky racetracks (Churchill Downs, Keeneland Racetrack, Turfway Racetrack, Kentucky Downs and Ellis Park Racetrack) and Colonial Downs Racetrack in Virginia.

The original pilot study conducted at Saratoga Race Course in 2021 found that in the four-month follow-up period after the analyzed races, horses with a significant gait abnormality in their Saratoga race took significantly longer to resume racing than did horses with either a moderate gait abnormality or horses with no gait abnormality. Horses with a significant gait abnormality also raced fewer times after the analyzed race than did the horses with no significant gait abnormality. Finally, horses with a significant gait abnormality completed fewer number of high-speed furlong events (official timed workouts and races) after the analyzed race than did horses with no significant gait abnormality. Based upon the findings of this study, wearable accelerometer-based inertial measurement unit sensors showed promise for use as a primary screening tool to identify horses with subclinical gait abnormalities associated with increased risk for attrition from horseracing.[20]

A recently published study conducted at Churchill Downs Racetrack found that these IMU sensors, worn by Thoroughbred racehorses while racing and/or breezing, identified three horses judged to be at increased risk of catastrophic musculoskeletal injury. Subsequent to veterinary examination that included advanced imaging (PET scan), it was found that two of these horses had lesions consisted with impending condylar fracture. The other horse had a lesion consistent with impending carpal slab fracture. Following periods of convalescence, the two horses with impending condylar fracture returned to racing and were identified by the sensor as no longer being at high risk of catastrophic musculoskeletal injury. The horse with impending carpal slab fracture has returned to training but has yet to return to racing. Currently these wearable IMU sensors no longer in use at NYRA racetracks.

Recommendation. A sub-committee of the American Association of Equine Practitioners (AAEP) Racing Committee is currently reviewing research proposals from commercial sensor manufacturers world-wide that will provide “proof of principle” that their sensor and algorithm can reliably identify horses at increased risk for injury. The most promising proposals will be funded for a one-year study period to begin on January 1, 2025 and be completed by January 1, 2026. At that time the AAEP will make a recommendation to the Thoroughbred racing industry for implementation of the proven system across the country. NYRA should join with other major racing associations to help fund these studies.

In the interim, NYRA should join with the ongoing study in progress in Kentucky and Virginia by placing sensors on all horses racing at NYRA racetracks to identify horses with subclinical gait abnormalities that are candidates for a lameness examination and routine or advanced imaging as indicated by that examination. This protocol is currently in place in

Kentucky and Virginia. The algorithm used for these sensors is undergoing real-time modification, using guided Artificial Intelligence as the numbers of horses wearing these sensors increase. The combined recordings of New York, Kentucky and Virginia Thoroughbred racehorses will provide a significantly larger study population of horses that will improve the accuracy of the evolving algorithm to identify horses that should be referred for veterinary examination to include routine imaging (digital x-rays and ultrasound) and advanced imaging (PET and CT) if the routine imaging is negative. A "holistic," multiple layered screening process to identify Thoroughbred racehorses that should be examined with advanced imaging is widely recognized as the most promising path forward to minimize the incidence of exercise-associated FMSI.

Anticipated Outcome. Objective data will enable regulatory veterinarians to identify horses with subclinical musculoskeletal conditions that are associated with increased risk for attrition. Trainers will be informed of these findings and will be required to have those horses examined for lameness by a veterinarian. This will enable a timely diagnosis and prompt treatment that will help to prevent serious injury and minimize the attrition of racehorses.

Status. To be considered.

8. Advanced Imaging

Concern. A comprehensive equine safety program has been in place in New York for more than a decade and the prevalence of equine FMSI has reduced nearly 50 percent during that period. This has been accomplished with a robust multi-faceted risk management program that employs conventional diagnostic imaging operated by board-certified veterinary specialists as well as continuing advancements in diagnostic imaging, and wearable biometric sensor technology (See Recommendation B.7).

The second step in this process will be referral of horses found to be at increased risk for injury after initial screening, to a veterinarian for a thorough lameness examination to include routine or advanced diagnostic imaging. Within the last few years advancements of equine imaging techniques have also contributed to the early identification of pre-existing musculoskeletal conditions that can predispose a horse to FMSI.[22] Proton Emission Tomography (PET scan) devices are now in use at some racing venues to provide advanced diagnostic imaging to identify horses with subtle musculoskeletal pathology (particularly in the fetlock joint) that can predispose to catastrophic injury. This technology was not available in New York during the 2023 Saratoga Race Meet. However, in 2024 the Rood and Riddle Equine Hospital installed a PET scan at their referral hospital adjacent to the Saratoga Race Course.

Recommendation. New York racing stakeholders invest in a comprehensive equine safety program that includes acquisition of advanced Imaging equipment (PET Scan and Standing CT) to be located at the Cornell Ruffian Equine Specialists adjacent to Belmont Park in conjunction with funding additional research to better understand the significance of the subtle bony lesions identified with this imaging technology; and develop new biometric markers that are associated with equine orthopedic conditions that have been shown to predispose Thoroughbred racehorses to catastrophic injury.

Anticipated Outcome. The development of a multi-modal screening and diagnostic imaging protocol will enhance our ability to identify horses that that are at increased risk for musculoskeletal injury. The purchase of advanced imaging equipment and required maintenance contracts is only one part of the investment in racetrack safety. Sustainable funding for research and development programs to properly interpret and use this powerful medical technology is also necessary. Strategic planning and sustainable funding for the appropriate use of this technology represent the future of a robust equine safety program for New York Thoroughbred racing.

The International Federation of Horseracing Authorities (IFHA) held a Global Summit on Equine Safety and Technology at Woodbine Racetrack in Toronto Canada June 12-14, 2024. The summit was attended by 90 leading research scientists, veterinary clinicians, and racing regulators from 13 countries. During the Summit innovative research was presented on methods to reduce fatal musculoskeletal injuries and exercise-associated sudden death. A consensus of the fracture workshop participants was a call for world-wide collaborative research to develop a “holistic” multi-modal screening approach to identify horses at risk for fatal musculoskeletal injury and design interventions to reduce the incidence of these fractures. Development of a comprehensive equine safety program in New York will make a significant contribution to this international collaborative research effort.

Status. Cornell University College of Veterinary Medicine faculty is preparing a proposal to address this concern.

C. Other Recommendations

1. Enhanced Ship-in Protocol

Concern. Existing current ship-in-and-out standard operating procedures are not sufficient to prevent horses from shipping into the stabling area at Saratoga Race Couse without the knowledge of the racing office or

regulatory officials. Additionally, there is currently no requirement for a horse that is on the Veterinarian's List in another jurisdiction to be examined by a NYRA regulatory veterinarian prior to performing a high-speed workout. As a result, Closed Caption, a horse that was on the Veterinarian's List in Kentucky, suffered a catastrophic injury while training on the Saratoga Main Track without first having been examined by a regulatory veterinarian.

Recommendations.

a. Improve the NYRA ship-in protocol (NYRA House Rule) to require that no horse can attempt high-speed exercise over a NYRA racing or training surface prior to notification of the racing office of their intention to do so. Additionally, any horse that ships into the Saratoga Race Course stable area that is on the Veterinarian's List in another jurisdiction must be examined by a NYRA regulatory veterinarian prior to performing high speed exercise.

b. Currently, horses that are placed on the Veterinarian's List by a regulatory veterinarian in any jurisdiction are also enrolled in the HISA National Veterinarian's List. When a horse on the Veterinarian's List is shipped from one jurisdiction to another, responsible persons are required to notify HISA of a change in location of a horse. At the time of this notification, an automatic email notice should be sent to the chief regulatory veterinarian of the destination to which the horse is being shipped.

Anticipated Outcome. This recommendation will ensure that the racing office is aware of all the horses training on NYRA property and also prevent horses that are on the Veterinarian's List in other jurisdictions from training on NYRA property prior to examination by a NYRA regulatory veterinarian. This will provide for increased veterinary scrutiny of horses already at risk for FMSI and will help to reduce the incidence of injury to both horses and riders.

Status. To be considered.

2. Provide Trainers with Access to Risk Factors

Concern. Individual horse risk factors are not uniformly distributed among the racing population. Risk for injury increases proportionally to the accumulation of multiple risk factors. Identification of individual horse risk factors in Thoroughbred racehorses prior to performing high-speed exercise is an important but time-consuming process. Trainers currently do not have the ability to access data that would accurately summarize the

risk of FMSI for each one of their horses. This is especially important when horses change ownership or trainers from time to time.

Recommendation. HISA currently has a risk factor database for Thoroughbred racehorses in the United States. Once the risk algorithm for this database has been validated (see Recommendation B.2), HISA should provide an owner and/or trainer portal that will permit trainers to obtain a current real-time risk assessment for the horses in their charge. At the time of transfer of horse ownership, access to the risk assessment for the transferred horse should be made available to the new owner and trainer.

Anticipated Outcome. Trainers and owners will be able to provide appropriate increased scrutiny to horses with a greater number of risk factors, and customize training programs accordingly in order to mitigate the risk of injury for those horses. This will help to reduce FMSI of Thoroughbred racehorses.

Status. To be considered.

3. Establishing an Improved Fatality Interview Protocol

Concern. The Commission found that voluntary statements were not obtained from all responsible trainers, riders, or attending veterinarians of horses that experienced a Fatality during the 2023 Saratoga Meet. This was due in large part to the fact that the immediate period following an equine fatality is filled with emotion, stress and it is extremely difficult to arrange for interviews from all responsible parties by Commission investigators. In cases where injured horses were not stabled in the Saratoga barn area, the responsible persons were simply not available to be interviewed.

Recommendation. Obtaining voluntary statements in a timely manner from trainers, riders and attending veterinarians is a high priority. However, given the above personal concerns and logistical challenges, Commission investigators should make a conscientious effort to complete the interview by telephone or videoconference in the days following the injury with emphasis on the value of gathering information that will be provided to investigators in the form of a checklist.

Anticipated Outcome: A more sensitive and better organized effort by Commission investigators to interview all responsible individuals will result in improved understanding of the circumstances surrounding the equine fatality and possibly help in the development of a corrective action plan to minimize the risk for equine fatalities going forward.

Status. A revised protocol for interviewing responsible individuals using a standardized checklist for appropriate questions is now under development by the Commission.

4. Design Thinking

The achievement of the goal to make racing safer at the Saratoga Race Couse will best be served by using a design thinking process. Design thinking is an innovative non-linear creative approach to finding solutions to real world problems.[23] In this case, our real-world problem is how to reduce equine fatalities at New York Thoroughbred racetracks. Equine fatalities are always a multi-factorial problem. For that reason, several interventions must be used synergistically to reduce the incidence of equine fatalities going forward.

Initially developed by Professor John Arnold and colleagues at Stanford University in the 1960s to help large American corporations in new product development and to increase research and design productivity, design thinking focuses on a collaboration between designers/researchers and end users to creatively solve problems. The design thinking process involves five stages:

- Empathize (understand the perspective and core needs of the end-user)
- Define (define the actual problem)
- Ideate (develop a range of ideas intended to solve the actual problem)
- Prototype (create a practical product, model, or system to solve the problem)
- Test (test the prototype in a real-world situation)

Dr. Arnold determined that the creativity and success of the design thinking process must be judged by the following outcome criteria:

- A better solution, not just different
- A tangible and measurable positive result
- Forward-looking relating to the needs of the end user
- A multiplicative (more than a simple additive) effect

The empathy stage is the same for each of the above recommendations. As racing stakeholders, we all share a responsibility to do everything possible to minimize the risk of injury to our horses and riders. The social license of Thoroughbred horseracing is in jeopardy to the degree that the public believes we are not living up to that responsibility.

The concern portion of the above-listed recommendations is a clear definition of several specific problems that need to be solved to make

racing safer (e.g. improve the consistency of the moisture content of New York Thoroughbred racetracks).

The recommendations themselves should be considered as a starting point for the ideate stage of the design thinking process that will lead to prototype development (procedures and equipment).

The sections are intended to provide positive measurable outcomes to be used in the testing stage.

For our purposes, a tangible and measurable positive result would be:

- Reduced incidence of equine fatalities at Saratoga
- Fewer surface changes during the Saratoga Meet
- Increased overall handle at Saratoga
- Improved attendance at Saratoga
- Improved public perception of Thoroughbred horseracing

The iterative component of design thinking is a sixth stage of the design thinking process. This stage involves examination and interpretation of stage five (test the prototype). If positive measurable results are obtained, the process is complete. If the prototype does not generate positive measurable results or appears to be only partially successful, then the ideate and prototype stages are repeated and tested again. This portion of the process is repeated as necessary to solve the problem.

XIV. References

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XV. Appendices

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A. Surface Conditions During the 2023 Saratoga Meet

The surface conditions at the racetrack are determined by the track superintendent and staff, using subjective criteria such as the visual appearance of the racing surface and the reaction of the surface to application of the maintenance equipment.

Prior to the start of racing each day, a “scratch sheet” is published (electronically) that lists each race for the day, horses that have been scratched and the condition of the racing surface for each scheduled race. The surfaces are monitored throughout the day and conditions may be modified according to changes in the environmental conditions. Throughout the day changes in the racing surface conditions are announced by the track announcer, the television broadcast prior to the race, and electronically by email for the public.

The following terminology is used by NYRA to classify the condition of the dirt racing surface. The characteristics of each classification are provided:

- “Fast” track: The track surface is smooth, dry and could have water applied.
- “Good” track: The track surface is moist, but no tire marks are evident after conditioning and the furrows made by the harrow hold together.
- “Muddy” track: The track surface is moist, there is no standing water on the track, but the surface still needs to be “plated.”
- “Sloppy” track: The track is saturated with water, there is standing water on the surface, and the track must be sealed prior to racing.

The classification of the racetrack may vary from race to race, depending upon weather conditions. The following terminology is used by NYRA to classify the condition of the turf courses:

- “Firm” track: The track surface is firm and resilient.
- “Good” track: The track surface is softer than a firm racetrack.
- “Yielding” track: The track surface has some “give” due to rainfall.
- “Soft” track: The track surface has a large amount of water in it.

B. Surface Classification for the 2023 Saratoga Meet by Day

Four hundred and ten races were conducted during the 2023 Saratoga Meet. The surface classification for each of these races is described in the following chart.

DATE	#	1	2	3	4	5	6	7	8	9	10	11	12	13
13-Jul	10	FST	FST	FRM	FRM	FST	FRM	FST	FRM	FST	FRM			
14-Jul	10	GD	GD	FST	FST	FST	FST	FST	FST	FST	FST			
15-Jul	11	FST	FST	FRM	FRM	FST	FRM	FRM	FST	FRM	FST	FRM		
16-Jul	10	GD	GD	GD	SLP/S	SLP/S	SLP/S	SLP/S	SLP/S	GD	GD			
19-Jul	10	GD	FST	GD	FST	FST	**FST**	FRM	FST	GD	GD			
20-Jul	10	FST	FST	FRM	FST	FST	FRM	FRM	FST	FRM	FRM			
21-Jul	10	GD	GD	GD	FST	FST	FST	FST	FST	YLD	FST			
22-Jul	11	GD	FST	GD	FST	FST	GD	FST	GD	FST	FST	FST		
23-Jul	10	FRM	FST	FRM	FST	FST	FST	FST	FRM	FST	FRM			
26-Jul	10	FRM	FST	FRM	FST	FRM	FST	FRM	FST	FRM	FRM			
27-Jul	10	FRM	FRM	FST	FST	FRM	FST	FRM	FST	FRM	FRM			
28-Jul	11	FST	FRM	FRM	FST	FST	FRM	FRM	FST	FRM	FST	FRM		
29-Jul	12	FRM	FST	FRM	FST	FST	YLD	SLP/S	SLP/S	SLP/S	SLP/S	SLP/S	SLP/S	
30-Jul	10	FST	FST	FST	FST	FST	FST	GD	FRM	GD	FST			
2-Aug	10	FRM	FST	FRM	FST	FRM	FRM	FST	FRM	FRM	FRM			
3-Aug	10	FRM	FST	FST	FST	FRM	FRM	FST	FRM	FRM	FRM			
4-Aug	7	MD/S	MD/S	MD/S	MD/S	MD/S	MD/S	SFT						
5-Aug	12	FST	FST	FST	FST	FST	SFT	YLD	FST	YLD	FST			
6-Aug	10	GD	FST	GD	GD	FST	FST	FST	FST	FST	FST			
9-Aug	8		FST	FST	FST		FST	FST	FST	FST	FST			
10-Aug	10	FST	FST	FST	FST	FST	FST	FST	FST	FST	FST			
11-Aug	11	FST	FST	GD	FST	GD	FST	FST	GD	FST	FST	FST		
12-Aug	11	FST	GD	FST	FST	FST	FST	GD	FST	GD	FST	GD		
13-Aug	10	FST	FRM	FST	FRM	FRM	FST	FST	FST	FST	FRM			

16-Aug	9	FST	FST	FST	FST	GD	FST	FST	GD	FST				
17-Aug	10	FST	GD	GD	FST	FST	FST	GD	FST	GD	FST			
18-Aug	10	MD/S	MD/S	MD/S	MD/S	MD/S	MD/S	MD/S	MD/S	MD/S	MD/S			
19-Aug	11	FST	FST	GD	FST	FST	GD	FST	FST	FST	GD			
20-Aug	10	GD	FST	GD	GD	FST	GD	FST	FST	FST	FST			
23-Aug	10	FRM	FST	FRM	FRM	FST	FST	FRM	FRM	FST	FST			
24-Aug	10	FST	FRM	FRM	FST	FST	FRM	FST	FST	FRM	FRM			
25-Aug	10	MD/S	MD/S	GD	MD/S	MD/S	MD/S	SLP/S	SLP/S	SLP/S	SLP/S			
26-Aug	13	FST	FST	FST	FST	GD	FST	FST	YLD	MD/S	MDY	YLD	MD	MD
27-Aug	11	FST	FST	GD	FST	GD	FST	FST	GD	GD	FST	FST		
30-Aug	9		MD/S	MD/S	GD	GD	GD	FST	FST	FST	FST			
31-Aug	10	GD	FST	GD	FST	FST	FST	GD	FST	FST	GD			
1-Sep	10	GD	FST	FST	GD	FST	FST	GD	FST	FRM	FST			
2-Sep	12	FRM	FST	FRM	FST	FST	FRM	FST	FRM	FST	FRM			
3-Sep	10	FST	FST	FST	FRM	FST	FRM	FRM	FRM	FST	FRM			
4-Sep	11	**FRM**	**FST**	**FRM**	**FST**	**FRM**	**FST**	**FRM**	**FRM**	**FST**	**FRM**			
TOTAL	410													

***Figure 1**. Surface conditions for the 410 races conducted during the 2023 Saratoga Meet. Dirt races are indicated in this chart by a tan cell color and turf races are indicated by a green cell color. Cells with a red border indicate races in which a FMSI occurred. Races with "/S" in the classification were run on a sealed racetrack. Yellow cells indicate races that were cancelled by NYRA management.*

C. Racetrack Maintenance Equipment

The following types of equipment are used to condition the cushion of the NYRA dirt racetracks with the goal of maintaining a safe, smooth, and consistent racing surface.

Motor Grader: A self-propelled machine with a rigid metal blade that is used to move dirt. Graders shape the racetrack, maintain the proper grade, and move material that washes downgrade adjacent to the inside rail due to rainfall. Graders move segregated cushion materials (mixture of sand, silt, and clay) back up towards the outside rail to create a consistent mix of the cushion components over the entire slope of the racing surface.

***Figure 1**. A motor grader being used to shape the surface of the Saratoga Race Course to grade. (Photograph by Scott E. Palmer)*

Harrow: A rigid metal frame with multiple rows of staggered and angled teeth that is pulled over the racetrack by a tractor to aerate and smooth the cushion to a precisely controlled depth to alleviate track irregularities.

***Figure 2**. Harrow being used on the Saratoga Main Track to smooth the surface and remove hoof prints. In this image the back rake has been lowered to provide a second layer of teeth to further smooth the surface. (Photograph by Scott E. Palmer)*

Roller: A rigid metal frame with large wide weighted roller wheels closely aligned along a transverse axel across the width of the frame that is pulled over the racetrack with a tractor. Rollers are used to close the track, remove irregularities in the surface, and compress and seal the racetrack. The roller leaves small tracks in the surface of the racetrack created by small spaces between the wheels. These tracks are removed by following the roller with a float to completely smooth the racing surface. Sometimes the track may be rolled multiple times and not plated.

***Figure 3**. Rollers being pulled by a tractor over the Saratoga Main track to compact the freshly harrowed surface. (Photograph by Scott E. Palmer)*

Float: One or two layers of rigid metal plates, used alone or combined with heavy rollers that is pulled over the racetrack by a tractor to smooth, compact and seal the racetrack to prevent excessive water from penetrating the cushion. A backrake is located on the on the back of the float. As a wet racetrack begins to dry, the backrake is lowered to scratch the surface of the racetrack prior to opening the racetrack with a harrow.

***Figure 4**. This float is being used to compact and seal the Saratoga Main Track after experiencing approximately ¾ inch of rainfall. (Photograph by Scott E. Palmer)*

Water Truck: Water trucks are used to apply water to the racetrack. These trucks hold approximately 4,000 gallons of water. Multiple nozzles extend from a boom on the rear bumper spray water on the racetrack as needed to ensure that the moisture content of the racetrack is sufficient to prevent excessive dryness of the cushion.

***Figure 5**. A water truck being used to apply water to the Saratoga Main Track. (Photograph by Scott E. Palmer)*

D. Saratoga Main Track Moisture Content 2022-2023

Comparison of moisture content of the Saratoga Main Track for the 2022 (**Figure 1**) and 2023 (**Figure 2**) Saratoga Race Meets, using Box and Whisker plots to characterize the degree of spatial and temporal variability of the data.

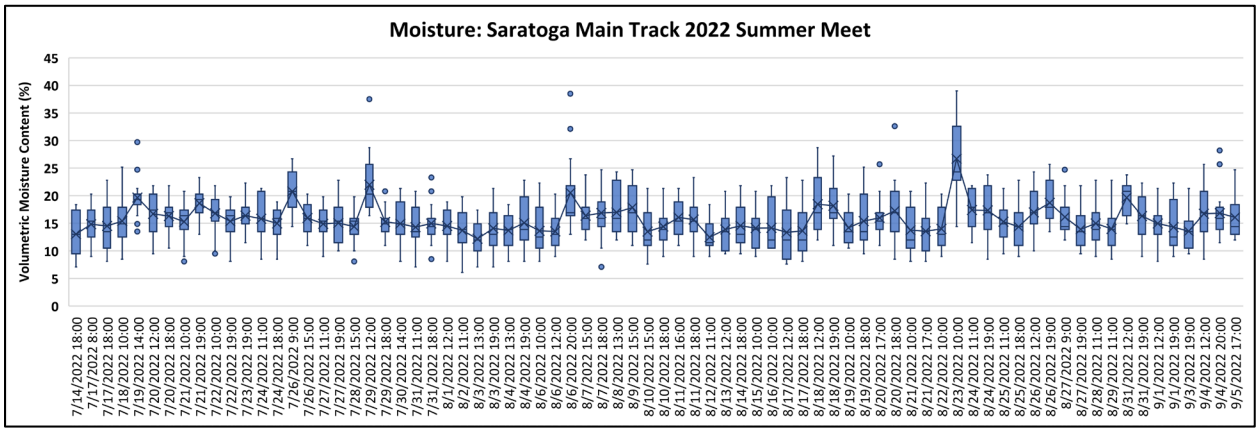

***Figure 1**.*

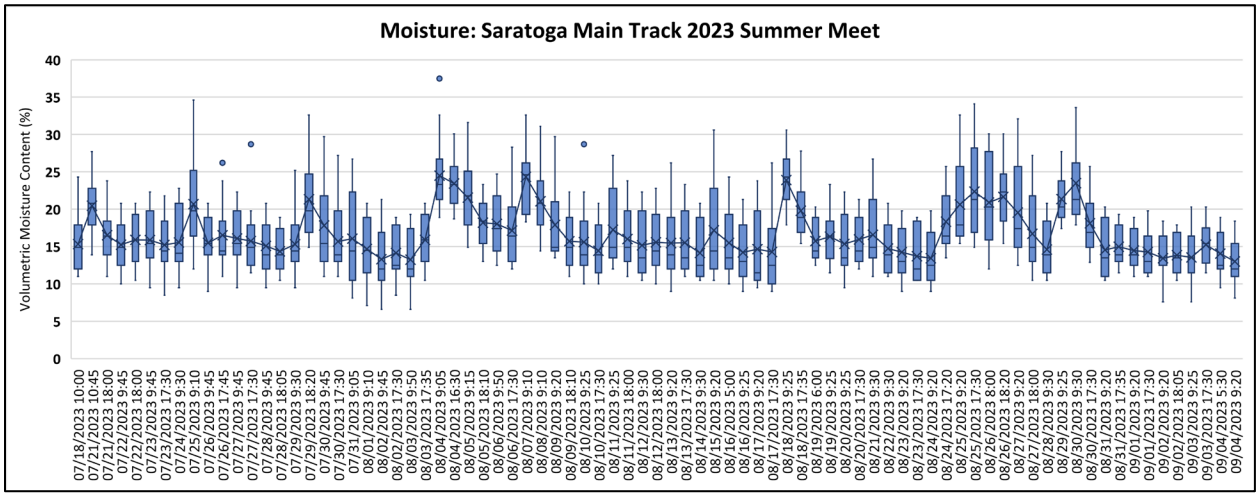

***Figure 2**.*

Notes:

1. The blue boxes contain 50 percent of the data for each measurement. The vertical length of the individual blue boxes indicates the degree of spatial variability of the moisture content of the racetrack. The greater the vertical length of the box, the greater the variability of the moisture content of the racetrack at the time those measurements were made.

2. The Horizontal black line in the middle of the box is the median of the data range for each measurement. The median is the middle number between the maximum and minimum measurements. Half of the measurements are greater than the median and half the measurements are less than the median.

3. The Whiskers represent the minimum and maximum data points for each group of measurements.

4. The black line that connects the median for each sampling time represents temporal variability of the measurements from day to day.

5. Small circles represent outliers of the data.

6. Note the difference in the vertical length of the blue boxes between the 2022 chart and the 2023 chart. The boxes in 2023 are much larger than those in 2022. This provides a visual indication that the variability of the moisture content of the Saratoga Main Track was greater in 2023 than in 2022.

Acknowledgement: Moisture data and the Box and Whisker Plots from the 2023 Saratoga Meet were provided by Dr. Michael Peterson and Mackenzie Rockefeller from the Racing Surface Testing Laboratory.

E. Statistical Analysis of Parametric and Non-Parametric Data

Scientific data analysis may be either parametric or non-parametric. Parametric tests are used to analyze data that is normally distributed. Non-parametric tests are used for data that is not normally distributed. Parametric data are symmetrically distributed in the shape of a bell curve (see **Figure 1** below). The central tendency of parametric data may be correctly determined by calculating the mean value of the data array. The mean value is calculated by adding all the observations (variables) together, then dividing the sum of the data by the number of observations.

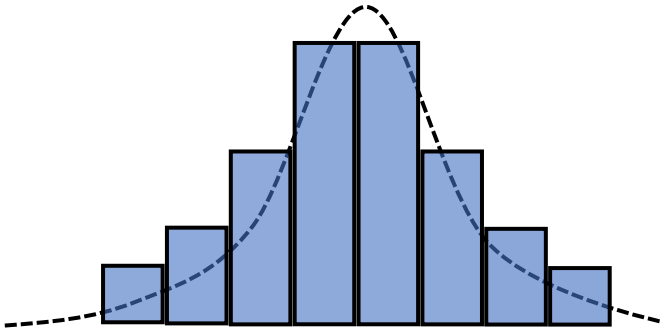

***Figure 1**. A histogram of Parametric data with a normal distribution of values. The majority of this data is centered around the middle of the "bell curve," shown here as a black dashed line. For purpose of illustration, this histogram represents a perfectly symmetrical distribution of data. The degree of symmetry of parametric data around the mean value may vary to some degree among parametric data sets.*

Non-parametric data does not have a normal distribution (see **Figure 2** below).

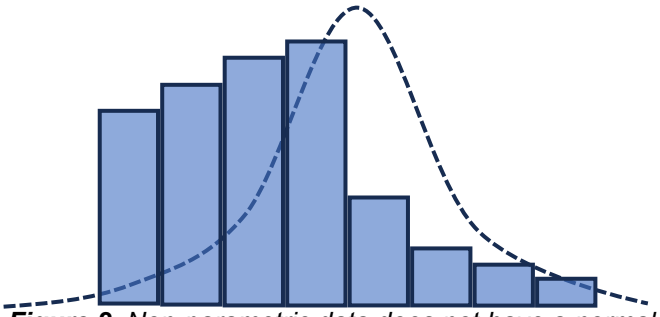

***Figure 2**. Non-parametric data does not have a normal distribution. The majority of this data is skewed to the left of center of the normal bell-shaped curve with a "tail to the right."*

The central tendency of non-parametric data is determined by calculating the median value for that data rather than the mean value. The median value is calculated by

determining the “middle” number between the maximum and minimum values in the data array. Half the values are greater than the median value and half of the values are less than the median value.

How do we know if we should use parametric statistical tests or non-parametric statistical tests to analyze data? Normality of data can be evaluated by either visual inspection using a histogram or by using a numerical test. For most purposes, a simple histogram is sufficient. A histogram is made by listing the data from the lowest value to the highest value, sorting all the values into arbitrary intervals (e.g., 0-10, 10-20, 20-30, etc.) and then counting the number of values that fall into each interval. Excel creates histograms easily from a single column of data. If the histogram resembles a normal bell curve with the majority of the values near the middle of the chart, the data is parametric. If the histogram is skewed to either side of the middle of the chart, the data is non-parametric.

This distinction between parametric and non-parametric data is important because different statistical tests are appropriately used to compare parametric data and non-parametric data. **Using the incorrect statistical test to analyze either parametric or non-parametric data can lead to inaccurate and inappropriate conclusions.**

For example, daily air temperature measured at the Saratoga Meet in 2023 has a parametric distribution with limited number of very low and very high values on either side of the majority of the data that is generally distributed toward the center of the histogram. (see **Figure 3** below).

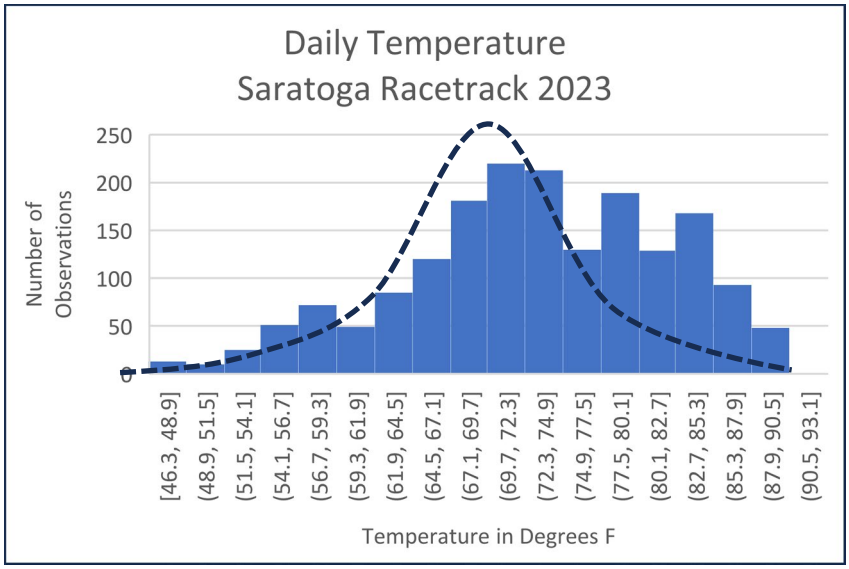

***Figure 3**. Histogram of the daily temperature (°F) during the 2023 Saratoga Meet is characterized by a parametric distribution of the temperature data.*

In this example, you can see that although the data is by definition parametric, this histogram indicates that there was a higher number of warm findings than cool ones. This is understandable because the Saratoga Meet takes place in July and August, a time of the year that is generally warm, hence the greater frequency of higher temperature readings. However, parametric statistical analysis of this data using the mean value of 73 degrees Fahrenheit to describe the central distribution of this data is still appropriate. Therefore, comparison among data arrays of daily temperature may be accomplished using the independent samples T Test.

On the other hand, measurement of the percent volume moisture content (%VMC) of the Saratoga Main Track during the 2023 race meet provides a good example of non-parametric data with a high frequency of extremely low values at the low end of the range of values, tapering off to a very low frequency of high values at the high end of the range of values as seen in **Figure 4** below.

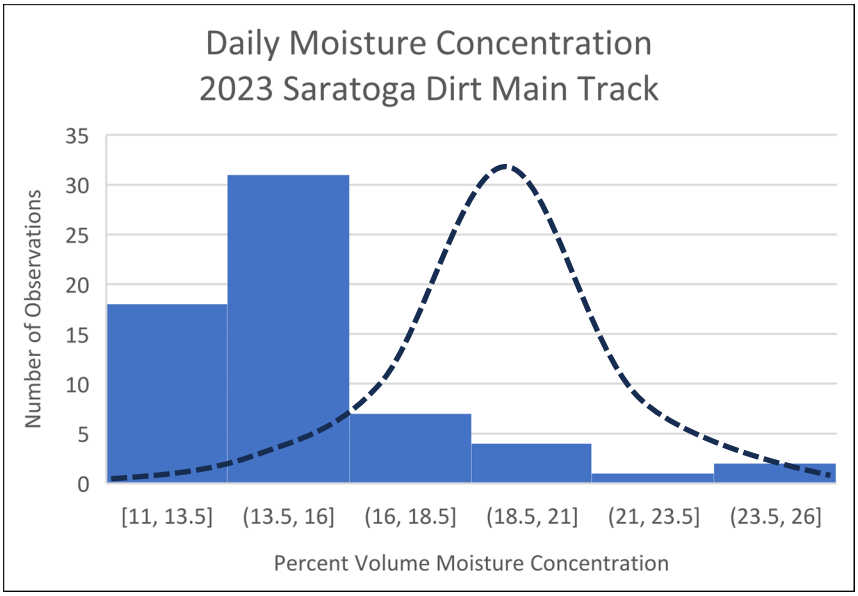

***Figure 4**. A histogram of the daily moisture concentration of the dirt main track during the 2023 Saratoga race meet characterized by a non-parametric distribution of the race track moisture data.*

The distribution of this data is shifted markedly to the left with a long “tail” to the right. This is referred to as a “skewed right” distribution. The daily moisture concentration of the Main Track during the 2023 Saratoga Race Meet had a “skewed right” distribution. In this case, the frequency of data was greater in the lower range of values relative to the rest of the data, causing the data to skew right. Non-parametric statistical analysis using the median value of 14.4 % VMC to describe the central tendency of this data arrays is appropriate. Comparison among data arrays of % volume moisture content and rainfall should be performed using a non-parametric statistical test such as the Mann Whitney U Test.

F. HISA's Review of Equine Fatalities During the 2023 Saratoga Race Course Meet

The Horseracing Integrity and Safety Authority Review of Equine Fatalities During the 2023 Saratoga Race Course Meet can be accessed at:

https://bphisaweb.wpengine.com/wp-content/uploads/2024/02/HISA-Saratoga-Report-02.26.24.pdf