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Matthew Drago
Acting Manager Assets & Technical Services, Ku-ring-gai Council
818 Pacific Highway, Gordon NSW 2072

18th September 2025
Re: Converting Charles Bean Oval to a best practice natural turf field

Matt,

Construction cost estimates

Based on the high-level evaluation, the cost to complete the construction of Charles Bean Oval as a best practice natural turf field is around $2.2 million (includes 20% contingency).

Lifecycle costs

The potential financial commitment over 30 years is provided in Table E.1. Key points to note:

- the best practice natural turf field will be functional at year 30 (if well maintained). Hence its year 30 net present value (NVP) would equal to its newly constructed value, with asset replacement for the synthetic field at year 30 is needed for a like for like comparison
- periodic works on the irrigation and drainage systems have been allowed for in the annual maintenance costs for a best practice natural turf field
- both best practice natural turf fields and synthetic fields can handle considerably higher wear levels than those currently occurring on the field, but as wear levels increase:
    - **natural turf:** condition of the field will become thinner by the end of the winter sport season (recover in spring), especially if wear levels were increased by more than 75%
    - **synthetic turf:** lifespan will be reduced in proportion to increased wear levels, requiring carpet replacement every 5 to 7 years for high wear levels (see product warranty).

For hybrid field built and maintained according to best practice an additional $1.4 million should be added to the construction (and lifecycle) costs of the best practice natural turf option.

Table E.1: Summary of expected lifecycle costs for best practice natural turf and synthetic fields

Item	Best Practice Natural Turf	Synthetic Turf	Notes
Estimated costs to complete construction	$2.2m[1]	TBC[1]	20% contingency included in the best practice natural turf field
Total maintenance costs	$1.25m	$0.78m[2]	Over 30-year period
Total asset renewal costs	Nil	$2.75m	Year 10 and 20 for the synthetic field
Asset replacement at Year 30[3]	Nil	$1.38m[3]	Synthetic field needs replacing at year 30 to be a functional facility[3]
Total financial commitment	**$3.45m[1]**	**$4.91m + construction cost[1]**	**Includes end of life replacement at year 30 for the synthetic field**

1 Includes 20% contingency
2 Excludes costs for maintaining synthetic turf stormwater treatment measures (filters/biofilters) as currently occurs, see Ausmap, 2024
3 at year 30 the synthetic (end of its useful life) requires complete replacement (shock pad, carpet, infill etc) so it remains a functional field

Filtration system

The current filtration system at Charles Bean Oval is inadequate at preventing turf fibre and infill losses from the site (Ausmap, 2024). The synthetic field design for nearby Norman Griffith Oval for example has a flat surface (0% fall), a surrounding plinth and a biobasin to treat the synthetic field stormwater.

A best practice natural turf field should comply with council's stormwater water quality targets if:

- a suitable (not excessive) fertiliser program is implemented
- appropriate maintenance practices are implemented (Section 3.2)

Weather cancellations

Sport can be cancelled due to adverse weather such as:

- **heat:** in addition to high temperatures, players can struggle at moderate temperatures if the humidity is high (NSW Football, 2023). Natural turf fields have fewer heat cancellations then synthetic because they can dissipate the suns radiation via photosynthesis & evaporative cooling. Synthetic fields with organic infill often exceed 55ºC when the air temperature rises above 30ºC (McKechnie, 2024)
- **intense rainfall:** can dislodge the synthetic infill so the surface needs re-grooming (and possibly topping up) before it can be played on. Intense rain can cause waterlogging on natural turf fields
- **other rain events:** can cause waterlogging on natural turf fields, with less interruptions on fields that have an effective drainage system that are built and maintained according to best practice. Aside from intense rain, other rain events typically have minimal impact on synthetic fields.

Based on modelling of 15 years of weather data a synthetic field with organic infill will have about 23 school days per year (this excludes holidays and weekends) when cancellations are likely. These are mostly associated with heat (Figure E.1). A well-constructed and maintained best practice field is likely to have about 9 school days per year when cancellations may occur. Weather can vary, with wet years causing more cancellations for natural turf and drought years causing more synthetic cancellations.

During the regular football season, the average annual cancellations are likely to be similar for a synthetic field (organic infill) and a well-constructed best practice field (Figure E.1). The impact of weather for pre-season, summer futsal and the summer break are provided in Section 4.4.

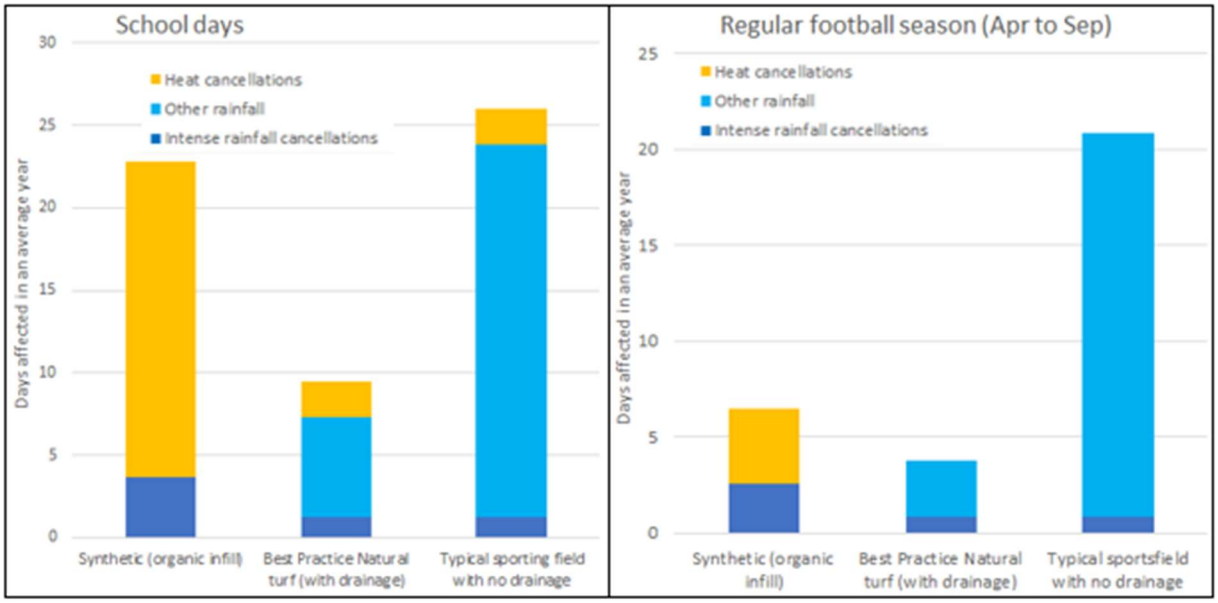

Figure E.1: Average days where adverse weather could impact on play. These are indicative measures of impact only, with actual impact depending on the time of the weather event relative to play times. Weather varies from year to year, with some years being hotter and drier (drought years) and other years being wetter.

Current wear levels

UTS Football Club has about 250 (2025) registered players in the winter sport season. The field is also used by Lindfield Learning Village (810 students). Based on school usage data and comparisons with similar sized schools, usage is estimated to cause the equivalent wear of about 200 registered football players. As such, the total winter wear (soccer + school) is the equivalent of about 450 registered players.

The actual equivalent wear appears to be lower than the above value given the field has fixed goals and has received only minor synthetic patching despite being 9 years old. By comparison, Cromer Park no. 1 (also a rubber crumb synthetic field) became unsuitable for play and was resurfaced after 9 years despite typically hosting less than 400 players per week. These differences could be attributable to hot weather cancellations by the school or even spreading of wear by the students relative to weekend soccer.

Annual usage hours capacity

A best practice field will be able to handle much higher hours or use than any of the current natural turf fields in Ku-Ring-Gai. If Charles Bean Oval was converted to best practice natural turf it would be capable of handling more than 2000 hours of annual usage i.e. similar to other intensely used best practice natural turf fields in the Sydney Basin. Most sporting fields receive a maximum of 1700 hours per year of school plus formal sport use (Appendix B).

Charles Bean Oval is in a unique situation as it is directly adjacent to a school that has minimal greenspace. As such, unlike any other sporting field in Ku-Ring-Gai LGA, Charles Bean Oval's annual usage could reach as high as 2500 hours per year. However, not all hours of use have the same impact, with school use typically causing less damage than formal sport. As such, carrying capacity is more accurately expressed in terms of registered players per week as described in the NSW Best Practice Guidelines for Sporting Fields (DCCEEW, 2025a).

Carrying capacity

If a natural turf playing field was constructed at Charles Bean Oval, then it would be capable of handling more than 550 players per week (22 to 38% higher than current school/soccer combined wear), provided:

- it is built in according to best practice (DCCEEW, 2025a)
- it is maintained according to best practice (DCCEEW, 2025a)
- intensely worn areas are effectively managed by:
    - not training in the gameday goal positions
    - shifting the position of the field midway through the winter sport season. This could be achieved using moveable goals (FIFA and FA approved models are available)
    - marking up the field 1 m east/west of where it was in the previous season, so the areas compacted and worn by the assistant referees have additional time to recover

A best practice field can handle 75% higher wear then current levels, with the most intensely used natural turf field in Sydney hosting ~800 registered players per week and sport from 3 schools. Whilst these wear levels are not recommended (field has 50% turf cover by the end of the football season, but remains suitable for community sport), this field recovers year after year with minimal turf patching. For higher wear levels, consideration should be given to laying hybrid turf in the 6-yard boxes.

As synthetic turf is a carpet, its lifespan will be reduced by a corresponding percentage to increased wear levels (see warranty documentation for the selected product).

If you require any further assistance, please do not hesitate to contact me on 0425 363 161.

Yours sincerely

Dr Mick Battam

Principal Soil Scientist

1 Background

Charles Bean Oval is located at Eton Road Lindfield. The synthetic surface occupies about 0.9 hectares that is marked up with a 105 x 68 m soccer field. The western goals are 8 m from the perimeter, with 3 m runoff zones on other sides (Figure 1). Based on the brief provided by Ku-Ring-Gai Council there has been increasing concern in the community around synthetic surfaces and their impact on the environment, including the (KC, 2025):

- **release of microplastics:** 3905 microplastic pieces (synthetic grass fibres) were captured in the drainage channel below Charles Bean Oval in two rain events (Ausmap, 2024). These microplastics had bypassed the 8 basket filters that are installed around the field (Figure 1)
- **release of crumbed rubber infill:** 15280 pieces of rubber crumb was found in ~3 kg of sediment from the drainage channel below the Charles Bean Oval (Ausmap, 2024). These had bypassed the 8 basket filters that are around the field (Figure 1)
- **localised heat island effect:** black globe thermometer readings by University of Western Sydney show that when air temperatures are below 30°C, the thermal experience of a human on synthetic turf can be like being in a place that feels like it is more than 45°C (NSW CSE, 2022)
- **effects of synthetic surfaces on human health:**
    - after 30 minutes of play on Charles Bean Oval, an average of 72 pieces of microplastics and 155 pieces of rubber crumb were brushed off each player (Ausmap, 2024)
    - arsenic, lead and other heavy metals in the stormwater channel below Charles Bean Oval were above freshwater trigger levels (Ausmap, 2024)
    - PFOS & PFHxS (banned chemicals since July 2025) were also above trigger levels in the drainage channel below Charles Bean Oval (Ausmap, 2024).

The school has also raised additional concerns (Appendix A), including:

- **surface causing high numbers of abrasions that require first aid**
- **rubber infill sticking to shoes:** being walked through school (and homes)
- **no access to shade**

Ku-ring-gai Council engaged AgEnviro Solutions Pty Ltd to provide a high-level description of the works needed to convert the site to a best practice natural turf field. A summary of these recommendations is provided in this memo which was written by Dr Mick Battam (Certified Professional Soil Scientist and Certified Irrigation Agronomist).

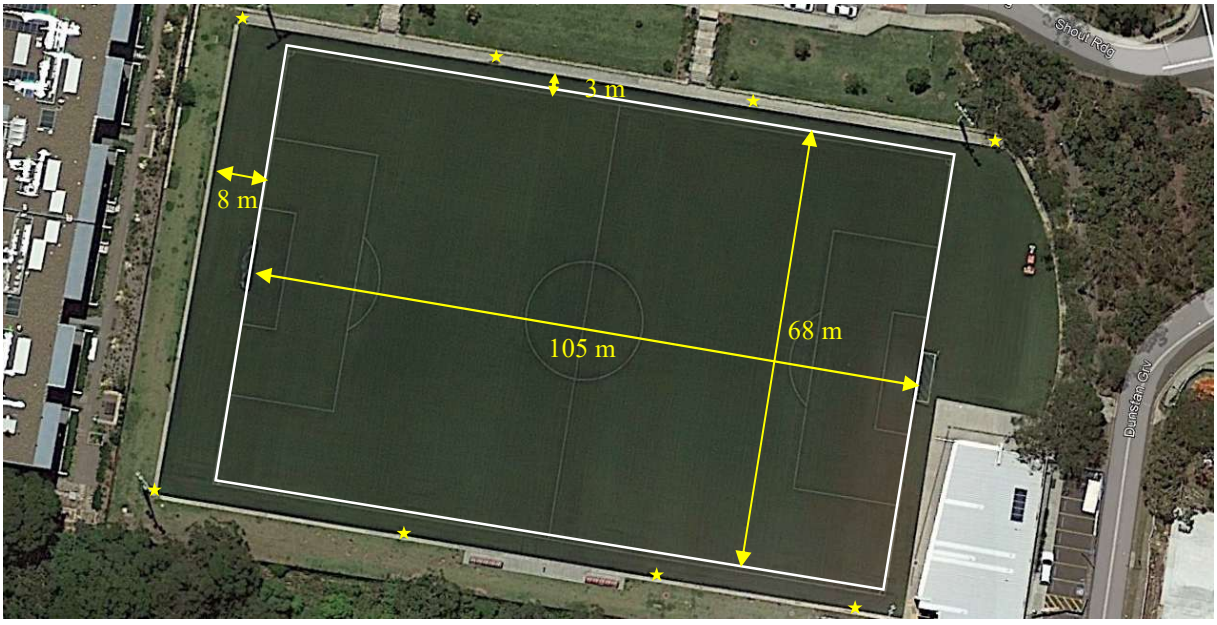

Figure 1: Charles Bean Oval, with stars showing drainage pits with 500-micron basket filters.

2 Site History

Charles Bean Oval was handed over to Ku-Ring-Gai Council as part of an agreement with Defence Housing Australia (DHA) in lieu of developer contribution payments to Council (KC, 2025). As part of that agreement, it was negotiated that the field be changed from natural turf to a synthetic surface. The project was managed and funded by DHA, with the completed field handed over to Council in 2013. Charles Bean Oval was built to FIFA standards at the time and was Ku-Ring-Gai Councils first synthetic sporting field (KC, 2025).

2.1 Site assessment findings

Non-invasive site investigations were performed in July 2025. The playing surface has a central ridge, with a 1 in 200 fall towards each of the sidelines. A dish drain surrounds the field conveys water to 8 major pits (Figure 1) which each have a 500-micron filter basket (Ausmap, 2024). Several small drainage pits (like drains in a residential shower) are also installed in the perimeter dish drains that have no filter.

2.2 Information provided

As-built plans were not available at the time of writing this report. However, Council did provide:

- design plans (McMahons, 2013) – see Figure 2
- geotechnical report (JK Geotechnics, 2021)
- project handover documentation (Greenplay Australia, 2013)
- email from Anthony Saba10/7/2025 saying: “From what I can remember, we installed a HDPE liner with a 300mm engineered gravel layer vertically draining with a crown off set from the centre with perimeter stormwater pits”
- email from Anthony Saba 25/7/2025 saying: “10-14mm gravel layer topped up with a 30mm fines layer (3-5mm with fines) that’s the general method”

2.3 Assumptions

Some contradictions exist in the plans and information provided by Council (Section 2.2). The natural turf reconstruction methodology in Section 3 assumes the McMahons (2013) design plan is accurate. As such the profile is assumed to consist of (Figure 2):

- 60 mm of synthetic turf containing sand and SBR infill (Greenplay Australia, 2013); overlying
- 20 mm layer of 3-5 mm gravel with fines; overlying
- 80 mm of 10 to 14 mm gravel; overlying
- 0 to 186 mm (this layer has a steeper fall then the surface) of 20 to 40 mm gravel; overlying
- HDPE liner (Anthony Saba email 10/7/2025); overlying
- compacted sub-base.

It is also assumed the subsoil drainage system is effective in removing all water percolating beneath the synthetic field.

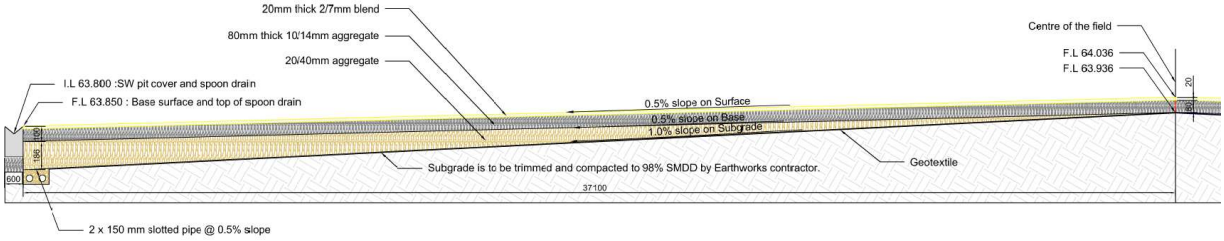

Figure 2: Lindfield soccer field design drawing MCM200203-04 Review H (McMahons, 2013).

3 Creating a best practice nature turf field

The following recommendations are provided as a high-level guide only, with detailed design beyond the scope of works of this report.

3.1 Outline of reconstruction procedure

Based on the profile described in Section 2.3, a best practice natural turf field could be achieved by:

- removing the synthetic carpet and infill from the site and deliver it to the recycling plant
- removing the upper 50 mm of material from site and dispose (~750 tonne)
- removing ~2000 tonne of gravel from the site and recycle or dispose
- replacing part of the concrete and dish drain so it will marry with the new finished surface
- installing an irrigation system that applies water evenly with minimal overspray and complies with the best practice guidelines (DCCEEW, 2025a)
- import and spread a minimum of 100 mm of 5 to 7 mm USGA gravel over the entire surface
- spreading 250 to 300 mm of growing media over the entire surface that complies with the requirements in the best practice guidelines (DCCEEW, 2025a)
- installing a slit drainage system that discharges into the underlying gravel layer
- watering and maintaining the field until the turf is fully established

The carrying capacity is highly dependent on the turf cultivar and growing medium. It is essential that both align with the requirements for high wear fields as described in the NSW Best Practice Guidelines (DCCEEW, 2025a). Consideration should be given to laying hybrid turf in the goal areas (allowing for the shifting field position).

3.2 Maintenance requirements

The field must be maintained according to the principles in the best practice guidelines (DCCEEW, 2025a). These practices will need to be tailored to the characteristics of the growing media which would be specified during detailed design. As a general guide, the maintenance will include:

- no oversowing of the field (ryegrass cannot handle high wear levels and will clog the profile)
- use of turf colourants to increase turf growth during the cooler months
- no irrigation of the field from late March until September (unless conditions are unseasonally dry and warm)
- ensuring effective management of intensely worn areas by using moveable goals (FA and FIFA approved models) to:
    - slide the field lengthways midway through the winter sport season. There is sufficient space for 3x full sized field configurations
    - not training in the gameday goal positions
- adequate fertiliser, pest and weed control
- aeration, dethatching and localised topdressing (possibly a general topdress every 5 years)
- performing minor repairs to high wear areas (forking, localised topdressing, minor plugs, etc.)

4 Carrying capacity of the field

The carrying capacity of sporting fields should never be expressed in hours per week. This is because clubs/schools often blanket book, resulting in some of the booked timeslots having minimal use. Furthermore, wear levels will vary significantly depending on:

- number of players using the field at a time
- age of players
- sporting code and
- site conditions (e.g. turf, soils, microclimate, waterlogging, traffic management etc).

Wear levels from school usage can also vary considerably based on whether it is being used for lunchtime play, formal sport, PDHPE classes or laying idle between these activities.

4.1 Annual usage hours carrying capacity of Charles Bean Oval

A best practice field will be able to handle much higher hours or use than any of the current natural turf fields in Ku-Ring-Gai. If Charles Bean Oval was converted to best practice natural turf it would be capable of handling more than 2000 hours of annual usage i.e. similar to other intensely used best practice natural turf fields in the Sydney Basin. Due to the timeframes when students are available for play, most fields receive a maximum of about (Appendix B):

- 1545 hours per year if they are only used for football and school use
- 1945 hours per year if they are used for football, school use and summer sport such as cricket

Charles Bean Oval is in a unique situation as it is directly adjacent to a school that has minimal greenspace. As such, unlike any other sporting field in Ku-Ring-Gai LGA, Charles Bean Oval's annual usage could reach as high as 2500 hours per year. However, as stated above not all hours of use have the same impact, with school use typically causing less damage than formal sport. As such, carrying capacity is more accurately expressed in terms of registered players per week as described in the NSW Best Practice Guidelines for Sporting Fields (DCCEEW, 2025a).

4.2 Using registered players per soccer field

Carrying capacity can be expressed as the number of registered players per week that a single full sized football field could handle over the winter sport season (DCCEEW, 2025a). Using this metric allows sporting field carrying capacity to be directly compared with player registrations.

UTS Football Club has about 220 (2022) to 250 (2025) registered players in the winter sport season. The field is also used by Lindfield Learning Village that has 810 students. The school only uses Charles Bean Oval in school hours (minimal use before and after school), with the field hosting (Appendix A):

- lunchtime and recess play (90 to 110 students on the field)
- PDHPE classes
- school sport
- fitness and training

Based on the usage data provided by the school and comparisons with other similar sized schools, the school usage is estimated to cause the equivalent wear of about 200 registered football players. As such, the total winter wear (soccer + school) is approximately the equivalent of about 450 registered players.

The actual equivalent wear appears to be lower than the above value given the field has fixed goals and has received only minor synthetic patching despite being 9 years old. By comparison, Cromer Park no. 1 (also a rubber crumb synthetic field) became unsuitable for play and was resurfaced after 9 years despite typically hosting less than 400 players per week. These differences could be attributable to hot weather cancellations by the school or even spreading of wear by the students relative to weekend soccer.

4.3 Logistical limit on player numbers

Soccer club limitations

There are not enough timeslots on the weekend for a single football field to host more than about 550 registered players (an adult game lasts for 2 hours when stoppage and turnover time is included). Whilst there are a handful of fields across Sydney that hosts more than 550 players, the limited space can restrict player development e.g. 5 teams training at once, juniors playing on undersized fields, etc. As such, 550 players per week should be regarded as the logistical limit for a single football field, regardless of whether it is natural turf or synthetic (DCCEEW, 2025a).

School limitations

The school currently has 810 student that cause the equivalent wear of about 220 registered football players (Section 4.1). The school has a planned capacity of about 2000 students (Appendix A) which in theory could increase wear levels to the equivalent of about 500 registered football players. However, it is likely that this could not be extended beyond the equivalent of about 400 registered football players without significantly impacting on the space available for school sport and PDPE classes.

4.4 Carrying capacity of Charles Bean Oval

If a natural turf playing field was constructed at Charles Bean Oval, then it would be capable of handling more than 550 players per week if (22 to 38% higher than current school/soccer combined wear):

- it is built and maintained according to best practice (DCCEEW, 2025a)
- intensely worn areas are effectively managed by:
    - not training in the gameday goal positions
    - shifting the position of the field midway through the winter sport season. This could be achieved using moveable goals (FIFA and FA approved models are available)
    - marking up the field 1 m east/west of where it was in the previous season, so the areas compacted and worn by the assistant referees have additional time to recover

A best practice field can handle 75% higher wear then current levels, with the most intensely used natural turf field in Sydney hosting ~800 registered players per week and sport from 3 schools. Whilst these wear levels are not recommended (field has 50% turf cover by the end of the football season, but remains suitable for community sport), this field recovers year after year with minimal turf patching.

If wear increases, consideration should be given to laying hybrid turf in the 6-yard boxes. As synthetic turf is a carpet, its lifespan will be reduced by a corresponding percentage to wear level increases.

4.5 Cancellations

Sport can be cancelled due to adverse weather such as:

- **heat:** in addition to high temperatures, players can also struggle at moderate temperatures if the humidity is high (NSW Football, 2023). Natural turf fields have fewer heat cancellations then synthetic because they can dissipate the suns radiation via photosynthesis & evaporative cooling
- **intense rainfall:** can dislodge the synthetic infill so the surface needs re-grooming (and possibly topping up) before it can be played on. Infill migration is especially problematic for sloped synthetic fields with organic infill (note the proposed design for Norman Griffiths Oval has 0% cross-fall). Intense rain can cause waterlogging on natural turf
- **other rain events:** can cause waterlogging on natural turf fields, with less interruptions on fields that have an effective drainage system that are built and maintained according to best practice. Low to moderate intensity rainfall is of minimal concern to well-maintained synthetic fields.

Although synthetic fields with organic infill can be cooler than those with crumb rubber, surface temperatures often exceed 55ºC when the air temperature rises above 30ºC (McKechnie, 2024).

Cancellations for the school

Based on modelling of 15 years of weather data a synthetic field with organic infill will have about 23 school days per year (this excludes holidays and weekends) when cancellations are likely. These are mostly associated with heat (Figure 3), with many more hot days in drought years. A well-constructed best practice field is likely to have about 9 school days per year when cancellations may occur (more in wet years).

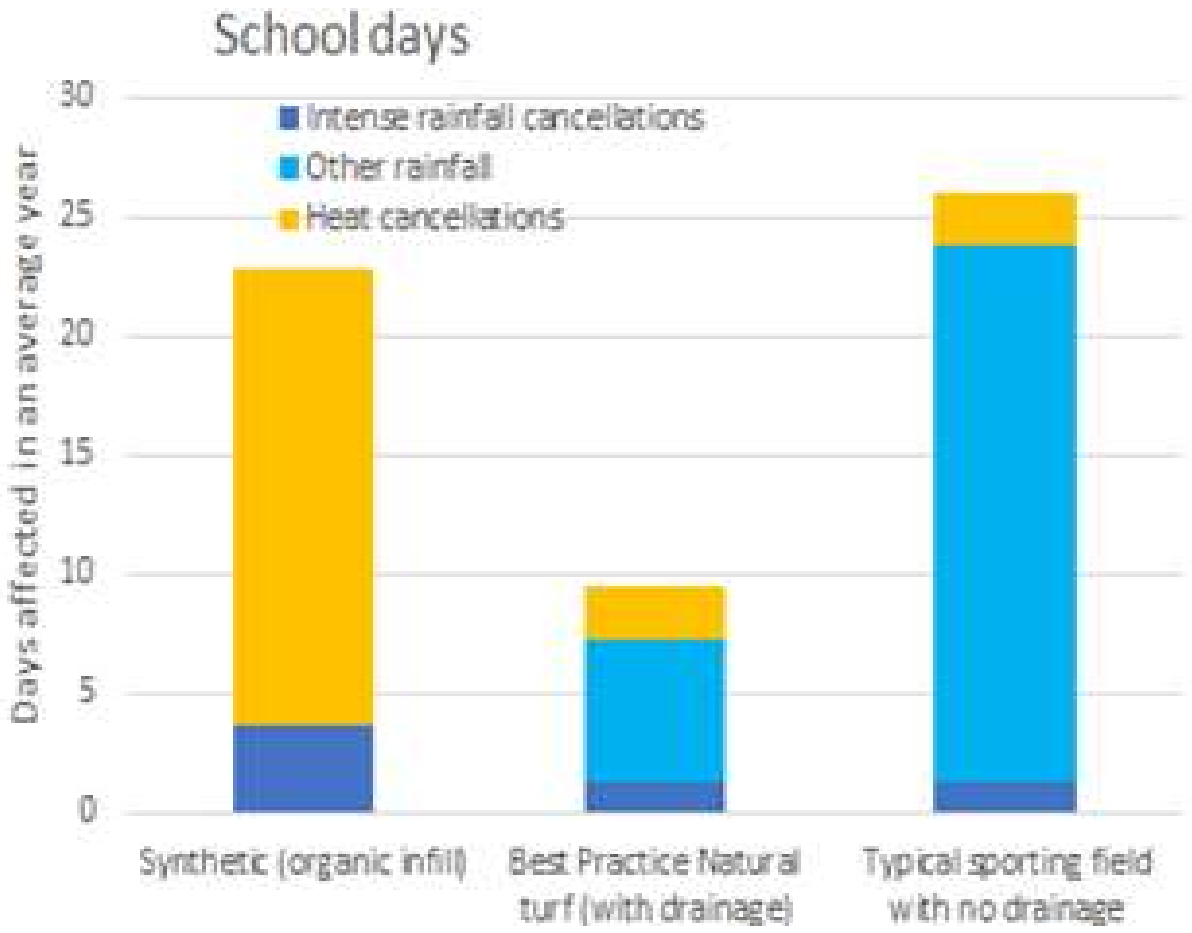

Figure 3: Average annual school days where adverse weather could impact on play. These are indicative frequencies only, with actual impact depending on the time of weather events relative to play times. Weather varies from year to year.

Cancellations for the soccer club

During the regular football season, the average annual cancellations are likely to be similar for a synthetic field (organic infill) and a well-constructed best practice field (Figure 4). Cancellations for pre-season, summer futsal and the summer break period have also been provided. Weather varies from year to year, with some years being hotter (typically drought years) and other years being wetter.

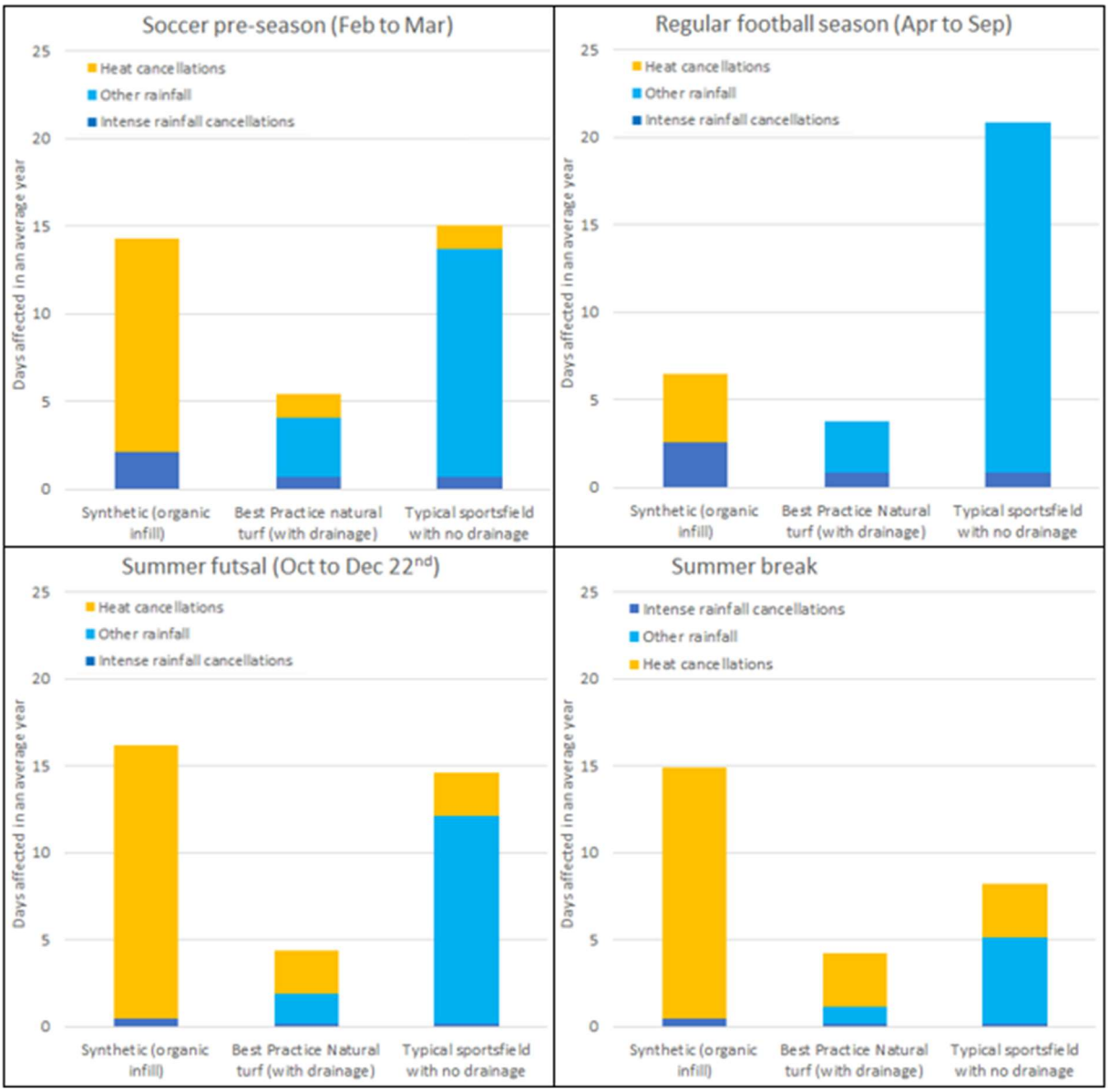

Figure 4: Average annual days where adverse weather could impact on play. These are indicative measures of impact only, with actual impact depending on the time of the weather event relative to play times. Weather varies from year to year.

Note: Playing only at night can mitigate heat cancellations for synthetic in the warmer months.

5 Irrigation requirements

If a best practice natural turf field is built at Charles Bean Oval, then its average annual irrigation requirements are likely to be about 2.3 ML (DCCEEW, 2025a). This represents an average annual water bill of about $6,200 (assuming $2.67 per KL). This water bill could be reduced if stormwater harvesting was performed onsite.

6 Stormwater

Ku-ring-gai Council DCP (2024) requires captured stormwater be treated to the standards described in Table 1. The Guidelines for Division 5.1 assessments for synthetic fields recommend that synthetic fields draining into sensitive ecosystems be independently assessed and comply with the Australian and New Zealand guidelines for fresh and marine water quality (DCCEEW 2025b, page 13).

Table 1: Captured stormwater treatment standards set out in Ku-ring-gai Council DCP (2024).

Pollutant	Ku-ring-gai DCP target	Target for 9200 m^2
Gross pollutants	150 kg/ha/yr	138 kg/yr
Total suspended solids	135 kg/ha/yr	124 kg/yr
Total phosphorus	0.7 kg/ha/yr	0.64 kg/yr
Total nitrogen	8.25 kg/ha/yr	7.6 kg/yr

6.1 Synthetic turf

PFAS, PFOS and PFHxS

Ausmap (2024) detected two banned chemicals (PFOS and PFHxS) in the drainage channel below Charles Bean Oval. Studies have also detected PFAS in other synthetic fields (NSW CSE, 2022).

Council should obtain a letter from the manufacturer and installer that none of the products (shock pad, carpet, infill, etc.) used in the synthetic field contain any of the banned chemicals in the IChEMS 2022 instrument. An independent NATA laboratory should verify that none of the materials used to construct the field contain any banned chemicals such as PFOS and PFHxS (Ausmap,2024). This could be a tender requirement so there is no cost to council.

Microplastics

The current filtration system at Charles Bean Oval is inadequate at preventing turf fibre from being lost from the site, with the Ausmap (2024) study finding:

- 3905 microplastic pieces were captured during two rain events in the drainage channel below the field. This included large fibres that had bypassed the 8 basket filters installed at the site
- about 10% of microplastic particles captured in the pits were smaller than the basket mesh size. This includes particles that are less than 100 microns in diameter

Filtration system upgrades are needed to prevent these losses. The filtration system proposed for Norman Griffiths Oval for example includes a biofilter (Battam, 2025, TurfOne & 2MH Consulting, 2024).

Infill losses

The current filtration system at Charles Bean Oval has not prevented rubber crumb losses, with 15280 pieces of rubber crumb in ~3 kg sediment samples from the drainage channel below the field (Ausmap, 2024). If the rubber crumb is replaced with an organic infill, then losses would likely increase given:

- SBR (~0.42 g/cm^3) is denser than Brockfill (~0.25 g/cm^3) and cork (~0.11 g/cm^3)
- the field has 1 in 200 slope instead of being flat (as proposed for nearby Norman Griffith Oval).

Mass migration of organic infill is an issue on other synthetic fields, with new designs ensuring field is flat and has a surrounding plinth to reduce losses. Aside from pollution, infill is expensive to replace and mass migration can lead to cancellations (Section 4.4).

6.2 Best practice natural turf

A best practice natural turf field should comply with the stormwater treatment standards in Table 1 if:

- a suitable (not excessive) fertiliser program is implemented
- ensuring other appropriate maintenance practices are implemented (Section 3.2)

7 Lifecycle costs

Cost data and cost estimates are highly sensitive to the underlying assumptions, site conditions, contractual requirements and other elements (e.g. market conditions). As such, the cost estimates provided in this section are high-level estimates that are based on available information.

Cost estimates have been compiled from multiple sources that include, but are not limited to:

- published contract values for works and services as released by Local Councils and State Government agencies
- published information guides
- industry sources and contacts from previous projects.

7.1 Construction costs

A best practice natural turf field for Charles Bean Oval has not been subject to detailed design. As such, the construction cost estimates have a higher degree of uncertainty than for a synthetic field which has already been through a detailed design process. As such, we have incorporated a 20% contingency into the cost estimate.

The overall cost for a best practice natural turf field is around $2.2m, with the major cost items (>$200,000) being:

- $600,000 for the specialised imported gravel and growing medium for the natural turf surface
- $600,000 removal and disposal/recycling of old synthetic surface and underlying aggregate
- $300,000 for contingency
- $280,000 for sports field irrigation, drainage and surface water management
- $240,000 for a new generation, wear tolerant turf cultivar (washed turf) and turf establishment

No additional stormwater treatment is needed for a best practice natural turf field to comply with Council DCP (2024) and DCCEEW (2025b) stormwater targets if an appropriate maintenance regime is implemented (Section 3.2).

7.2 Maintenance costs

The anticipated maintenance costs for a best practice natural turf field at Charles Bean Oval are likely to be around $40,000 pa. This cost assumes maintenance is not undertaken by Council staff but are contracted out to qualified external contractors. It includes irrigation water costs.

Based on the available information, the annual maintenance costs for a synthetic turf field at Charles Bean Oval are likely to be about $25-$35,000 per year. This is consistent with the values of synthetic turf maintenance contracts where the contract value has been released. These maintenance costs do NOT include:

- **synthetic surface renewal costs (Section 7.3):** which equate to around $138,000 per year
- **maintenance of the synthetic turf stormwater treatment system (Section 6.2):** regular maintenance will need to be performed to prevent clogging or bypassing (Ausmap, 2024) of filters/biofilters.

7.3 Surface renewal costs

Best practice natural turf fields do not require resurfacing, with turf plugging and/or minor patching allowed for in the maintenance costs (Section 7.2). Periodic asset renewal works on the irrigation and sports field drainage systems have been incorporated into the annual maintenance costs.

According to synthetic turf information guides, synthetic turf fields require resurfacing every 8 to 10 years at a cost of $1.1 million per soccer field (~$130/m^2). This rate is low compared to recently completed projects, where the published contract value for replacing a synthetic field was around $145-$155 per m^2 (e.g. Blackman Oval and Moore Park). At a rate of $150/m^2, the surface renewal costs for a synthetic field at Charles Bean Oval is ~$1.4m. This equates to $140,000 per year if the surface is replaced every 10 years.

7.4 Lifecyle costs

The potential financial commitment over 30-year period is summarised in Table 1. Key points to note are as follows:

- the best practice natural turf field if well maintained will be functional at year 30 have a net present value (NVP) equal to its newly constructed value, so asset replacement for the synthetic field at year 30 is needed for a like for like comparison
- a best practice natural turf field does not have a finite life and does not require replacement or resurfacing if best practice maintenance is conducted regularly. Periodic works on the irrigation and drainage systems have been allowed for in the annual maintenance costs for a best practice natural turf field
- both best practice natural turf fields and synthetic fields can handle considerably higher wear levels than those currently occurring on the field, but as wear levels increase:
    - **natural turf:** condition of the field will become thinner by the end of the winter sport season (recover in spring), especially if wear levels were increased by more than 75%
    - **synthetic turf:** carpet lifespan will be reduced in proportion to the increase in wear levels, requiring replacement every 5 to 7 years at extreme wear levels (see warranty).

For hybrid field built and maintained according to best practice an additional $1.4 million should be added to the construction (and lifecycle) costs of the best practice natural turf option.

Table 1: Summary of expected lifecycle costs for best practice natural turf and synthetic fields

Item	Best Practice Natural Turf	Synthetic Turf	Notes
Estimated costs to complete construction	$2.2m[1]	TBC[1]	20% contingency included in the best practice natural turf field
Total maintenance costs	$1.25m	$0.78m^2	Over 30-year period
Total asset renewal costs	Nil	$2.75m	Year 10 and 20 for the synthetic field
Asset replacement at Year 30[3]	Nil	$1.38m[3]	Synthetic field needs replacing at year 30 to be a functional facility[3]
Total financial commitment	**$3.45m[1]**	**$4.91m + construction cost[1]**	**Includes end of life replacement at year 30 for the synthetic field**

1 Includes 20% contingency

2 Excludes costs for maintaining synthetic turf stormwater treatment measures to prevent clogging or bypassing of filters/biofilters by infill or plastics (as currently occurs, see Ausmap, 2024)

3 at year 30 the synthetic turf field is at the end of its useful life and requires complete replacement (shock pad, carpet, infill etc) to ensure it remains a functional facility

8 Project timeframes

A best practice natural turf field could be constructed in 4 to 6 months following award of the construction contract if conditions are suitable (e.g. contractors are available, design and procurement processes proceed smoothly, weather conditions are favourable). The indicative, broad timeframes are as follows:

- Design: about 1-2 months
- Procurement (Tendering): about 4 months
- Construction: about 2 months (subject to weather conditions)
- Turf establishment (ready for play): 2 to 4 months if turf laid in growing season (October to March).

9 Conclusion

A best practice field will be able to handle much higher hours or use than any of the current natural turf fields in Ku-Ring-Gai. If Charles Bean Oval was converted to a best practice natural turf:

- **Annual usage capacity:** best practice field would be capable of handling more than 2000 playing hours per year (like other intensely used best practice fields in the Sydney Basin). However, the NSW Best Practice Guideline for Sporting Fields advising against the use of usage hours for estimating wear (DCCEEW, 2025a), with an hour of school PDHPE classes causing less wear than formal sport use
- **Carrying capacity:** best practice natural turf would be capable of handling up to 75% higher wear then current wear levels (Section 4.4)
- **Weather cancellations for the school:** less for best practice natural turf relative to synthetic (considerable heat cancellations in semesters 1 & 4)
- **Weather cancellations for football:**
    - Football season: similar cancellations for a best practice natural turf and synthetic field
    - Pre-season and summer futsal: there would be more cancellations for a synthetic field, but these could be mitigated by only playing at night (less use hours)
- **issues raised by the school:** best practice field would overcome existing synthetic turf related issues such as:
    - synthetic surface causing high numbers of abrasions that require first aid
    - synthetic field infill sticking to shoes: being walked through school (and homes)
    - excess heat from synthetic fields (issue also for synthetics with organic infill)
    - student exposure to lead, arsenic, zinc and PAHs (Ausmap, 2024)
- **other community concerns:** best practice field would overcome the following synthetic turf related issues that have been observed on site (Ausmap, 2024):
    - plastic fibre losses to the environment
    - infill losses to the environment
    - banned substances such as PFOS and PFSxS being lost to the environment

The overall cost to convert Charles Bean Oval to a best practice natural turf field is about $2.2m (includes 20% contingency), with the lifecycle costs being less than synthetic (Table 1). The best practice natural turf field if well maintained will be functional at year 30. Hence the best practice field at year 30 should be assigned a net present value (NVP) equal to its newly constructed value, with asset replacement for the synthetic field at year 30 is needed for a like for like comparison.

10 References

Ausmap (2024) Investigation into rubber crumb and synthetic grass loss at Charles Bean Oval

Battam (2022) Winter usage, wear and carrying capacity of sporting fields in the Sydney Basin

Battam (2025) Memo on converting Norman Griffiths Oval to a best practice natural turf field (18/8/2025)

DCCEEW (2025a) Best-practice guidelines for sporting fields: A guide for climate-resilient playing surfaces in New South Wales. Department of Climate Change, Energy, the Environment and Water

DCCEEW (2025b) Guidelines for Division 5.1 assessments (Addendum for synthetic sports fields)

Football NSW (2023) Extreme heat policy

Greenplay Australia (2013a) Case study: Charles Bean Oval Lindfield NSW

Greenplay Australia (2013b) Artificial Sports Field Construction Works at 100 Eton Road, Lindfield NSW: Project handover documentation

McMahons (2013) Lindfield soccer field design drawing MCM200203-04 Review H

NSW EPA (4/7/2025). Three PFAS chemicals banned this week. https://www.epa.nsw.gov.au/news/epamedia/250704-three-pfas-chemicals-banned-this-week

IChEMS 2022 instrument: Industrial Chemicals Environmental Management (Register) Instrument 2022

JK Geotechnics (2021) Geotechnical investigation for proposed sports ground at Edelea, UTS Ku-Ring-Gai campus, off Eton Road Lindfield

Ku-ring-gai DCP (2024) Ku-ring-gai Development Control Plan

Ku-ring-gai Council (2025) Charles Bean Surface Replacement: Consultants brief

NRMMC, EPHC and NHMRC (2009) Australian guidelines for water recycling: Managing health and environmental risks (Phase 2)

NSW CSE (2022) Independent review into the design, use and impacts of synthetic turf in public open spaces. NSW Government Chief Scientist and Engineer

TurfOne and 2MH Consulting (9/5/2024). Norman Griffiths Oval synthetic football (soccer) pitch redevelopment

Appendix A: School usage of Charles Bean Oval

Lindfield Learning Village provided the following information regarding school usage of Charles Bean Oval.

How many primary students attend the school? **379 (current enrolment)**

How many secondary students attend the school? **431 (current enrolment)**

NB the school has capacity to enrol a larger number of total students than the current enrolment figures. Planned capacity is approximately 2000 students. The school would be seeking access to Charles Bean Oval before and after school for training times to enable an adequate sports program.

Are there any factors that limit the usage of Charles Bean Oval for the students? **No access to shade; current issues with rubber infill sticking to shoes and being walked through the school (and homes) in students' shoes. Inadequate provision of bins. Current surface results in high number of abrasions requiring first aid attention from school. General public use during LLV hire times has presented challenges for staff to monitor safety of students at times when general public has proximity to students or taking photos of the area/students without express permission.**

Would Charles Bean Oval be used for a similar number of hours per week by the school if it were a natural turf field? **Yes, the same number of hours would be requested by the school.**

NB. Current hire hours are 9am to 3pm. These hours prevent the school from being able to do before or after school sport/training etc. Charles Bean Oval is hired out by Ku-ring-gai Council most mornings and afternoons to private schools and football clubs.

Before and after school use of Charles Bean Oval (do not include other areas):

Daily period	Number of students that play sport on Charles Bean Oval	Additional number of students doing other active play activities on Charles Bean Oval (e.g. chasings)
30 minutes before school starts	**0 – hired by Ku-ring-gai Council to private schools and fitness providers**	**0 – hired by Ku-ring-gai Council to private schools and fitness providers**
Just before school starts	**0 – LLV hire time is from 9:00am.** - **Secondary school starts 8:50am** - **Primary school starts 09:00am**	**0 – LLV hire time is from 9:00am.** - **Secondary school starts 8:50am** - **Primary school starts 09:00am**

Questions about lunchtime and school play on Charles Bean Oval (do not include other areas)

Daily period	Number of students that play sport on Charles Bean Oval	Additional number of students doing other active play activities on Charles Bean Oval (e.g. chasings)
Recess for primary school kids (30 minutes) – 11:30am to 12:00md	**30-40**	**20**
Lunchtime for primary school kids (30 minutes) – 1:20pm to 1:50pm	**30-40**	**20**
Recess for secondary school kids (30 minutes) – 11:30am to 12:00md	**40-50**	**20**
Lunchtime for secondary school kids (30 minutes) – 1:20 to 1:50pm	**40-50**	**20**
Just after school ends	**0 – LLV hire time is to 3:00pm.** - **Secondary school ends 3:10pm** - **Primary school ends 3:00pm**	**0 – LLV hire time is to 3:00pm.** - **Secondary school ends 3:10pm** - **Primary school ends 3:00pm** **A number of families use the space immediately after the school day, however, it is not a designated supervision area for the school**
30 minutes after school ends	**0 – hired by Ku-ring-gai Council to sports associations**	**0 – hired by Ku-ring-gai Council to sports associations**

Questions Charles Bean Oval use on school sports day/s:			What sport/s are played on Charles Bean Oval on school sports day?			
	What day is school sports day? E.g. Wednesday	What hours does school sport run for? E.g. 12 to 3 pm	Term 1 e.g. softball	Term 2 e.g. soccer	Term 3	Term 4
Primary school	**Fridays**	**9-2.45pm**	**Various**	**Various**	**Various**	**Various**
Secondary school	**Tuesdays**	**1:50 - 3:10pm**	**Soccer / Oz Tag**	**Soccer / Ultimate frisbee**	**League Tag**	**Soccer / Softball**
	Thursdays (Beyond program)	**12:00 – 3:10pm**	**Fitness & Training**	**Fitness & Training**	**Fitness & Training**	**Fitness & Training**

Questions Charles Bean Oval use for PDHPE classes	For a typical student (1 person), how many hours per week is Charles Bean Oval be used for PDHPE classes? And what sport is typically played?			
	Term 1 e.g. Nil (PDHPE has swimming)	Term 2 e.g. 1 hour/wk of soccer	Term 3	Term 4
Primary school (248 students)	**School based program 70 mins per week**	**External Sports provider 70 mins per week**	**School based program 70 mins per week**	**School based program 70 mins per week**
Secondary school (350 students)	**80 mins per week**	**80 mins per week**	**80 mins per week**	**80 mins per week**
Activities included in PDHPE curriculum	**OzTag, Touch Football, Flag Football, AFL, Soccer, Ultimate Frisbee, Vortex, European Handball, Volleyball, Athletics/Running, Indigenous Games, Cricket, Softball, Baseball, T-Ball, Fitness Training**			

Questions about Charles Bean Oval use for formal school sport played outside of school hours	How many students are using Charles Bean Oval for school sport that is OUTSIDE school hours? What sport are they typically using Charles Bean Oval for?			
	Term 1 e.g. Nil	Term 2 e.g. 24 students on Charles Bean for soccer training/games	Term 3	Term 4
	There is no school sport scheduled after school hours – current hire arrangements are only 9:00am to 3:00pm on school days. **The school would be seeking access to Charles Bean Oval before and after school for training times to enable an adequate sports program.**			

Appendix B: Breakdown of hours of use

Whilst clubs often blanket book, most soccer fields (natural or synthetic) receive:

- a maximum of about 1200 hours per year of formal sport use (Table B.1)
- less than 351 hours per year of school usage (Table B.1)

A best practice field will be able to handle much higher hours or use than any of the current natural turf fields in Ku-Ring-Gai. If Charles Bean Oval was converted to best practice natural turf it would be capable of handling more than 2000 hours of annual usage i.e. similar to other intensely used best practice natural turf fields in the Sydney Basin. However, not all hours of use have the same impact, with school use typically causing less damage than formal sport. As such, carrying capacity is more accurately expressed in terms of registered players per week as described in the NSW Best Practice Guidelines for Sporting Fields (DCCEEW, 2025a).

Table 1: Breakdown of maximum annual usage hours for most sporting fields

Activity	No. of weeks	Weekly usage	Hours per year
Pre-season football	8 weeks (Feb. to March)	20 hours	160
Winter season games	23 weeks (April to September)	18 hours (8 am to 5 pm Saturday & Sunday)	414
Winter season training	23 weeks (April to September)	20 hours per week (4:30 to 9:30 pm for 4 nights/week)	460
Summer Futsal (Oct. to Dec.)	8 weeks (Feb. to March)	20 hours[1]	160
January	0	0	0
School usage	39 weeks (school year)	0 to 9 hours (most fields)	0 to 351
		Total	**1545***

*usage levels could be increased by up to 400 hours per year if the field is fully booked for cricket, baseball or softball during the summer sport season. Summer temperatures are often not conducive to daytime football (Section 4.5)