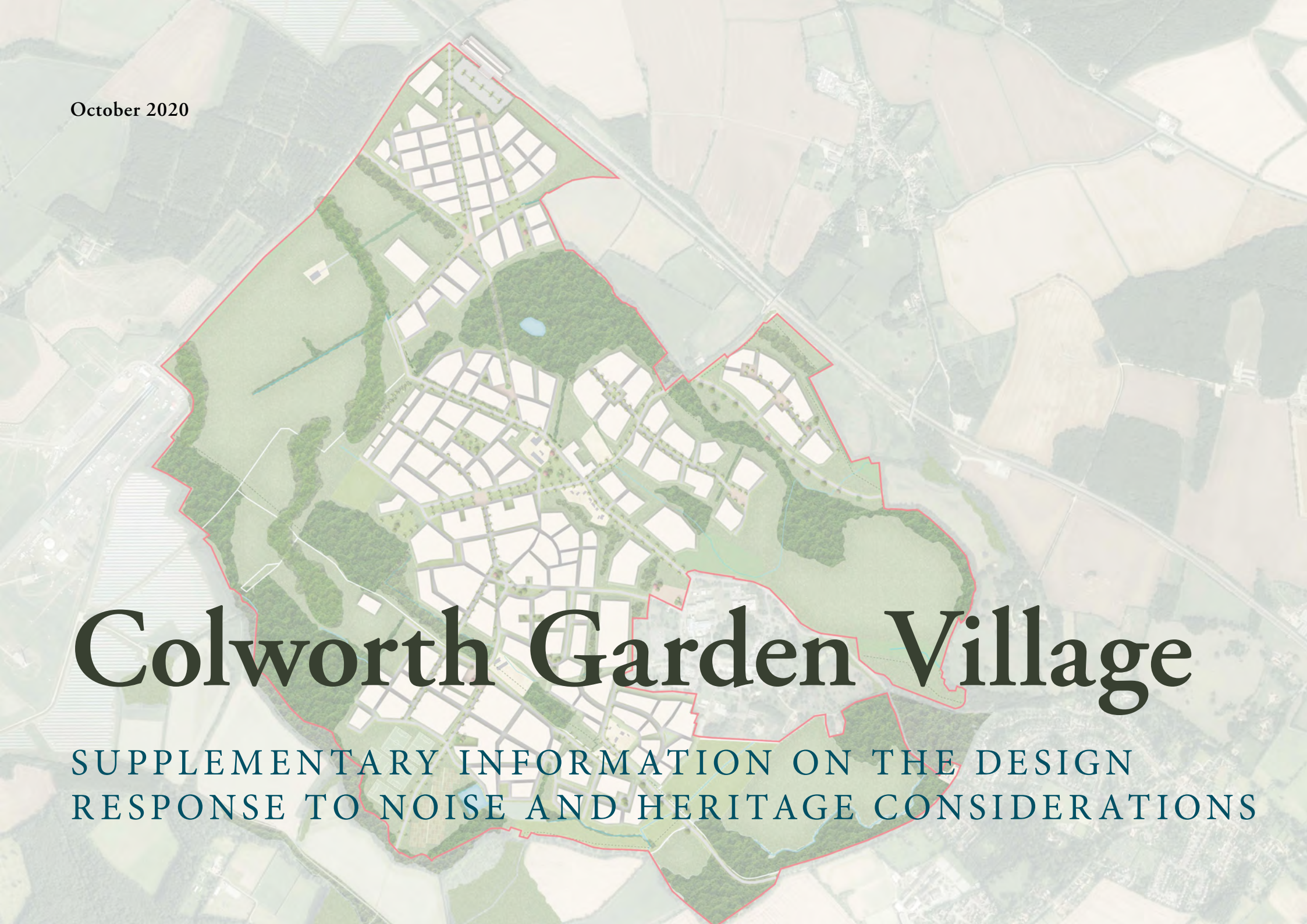
October 2020



Colworth Garden Village

SUPPLEMENTARY INFORMATION ON THE DESIGN RESPONSE TO NOISE AND HERITAGE CONSIDERATIONS

WRENBRIDGE

Preface

The Colworth Estate is located to the north-west of the settlement of Sharnbrook and wraps around Colworth Science Park. The Science Park is a leading site for commercial research and development and home to Unilever's Scientific Research in discovery, central product safety, sustainability and global product development activities, as well as a range of other growing business organisations and academic research groups.

Wrenbridge Land Ltd / Fiera Real Estate are promoting land within the Estate for allocation as a Garden Village in the Bedford Borough Council Local Plan Review. This document provides further information requested by the Council in respect of design, noise and heritage mitigation.

Contents

1 Introduction

Purpose and Background

Wrenbridge Land Ltd / Fiera Real Estate (herein referred to as 'Wrenbridge') are promoting Colworth Garden Village for allocation in the Bedford Borough Council Local Plan Review.

The proposals comprise:

- 4,500 mixed tenure dwellings
- Circa 7ha of employment land allowing for the expansion of the Science Park
- Associated social and community infrastructure, including primary schools, local shops
- Associated green and blue infrastructure including the retention of existing woodland habitat, golf course and the creation of new habitat, playing fields, SuDS features, bunds and landscaping within a 'country park'.
- Two new access roads to the A6 including the creation of a new access from the Science Park through the development, and an assumption that access to Santa Pod will also be made available along the Forty Foot Lane route
- A parkway railway station which would have two platforms, pedestrian footbridge, passenger waiting facilities, bus interchange and parking for some 500 cars and cycles.

This document has been prepared in response to a request from the Council for further information on the measures proposed to mitigate noise from Santa Pod, mitigate impact on heritage assets, how these measures have then been incorporated within the overall Garden Village design rationale, and how that fits with the rural context of the site.

Illustrative Masterplan

Developing the Design Response

The development of the masterplan has been influenced by three main drivers:

- Garden Village principles
- Existing rural context and heritage
- Noise mitigation.

The above drivers are discussed in detail in sections 2 to 4 of this document but summarised briefly below.

Garden Village Principles

In recent years there has been a renewed interest in the idea of the garden city, and how the principles that underpin that idea can be used to inform the delivery of new communities today.

These principles and precedent examples have been analysed to inform the future development at Colworth, to establish the best properties of this popular movement and implement them into the masterplan for modern living.

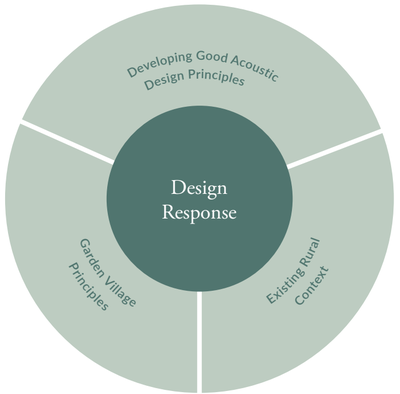
Existing Rural Context

Surrounding developments were visited and intrinsic qualities observed and analysed in order to anchor the development to the area's context. At the same time, the setting of a heritage assets within this rural context was considered.

Noise Mitigation

The proposed Colworth Garden Village is situated in a rural setting. Most of the time this location experiences a relatively quiet and peaceful soundscape with a degree of noise from the road, rail networks and the infrequent noise emissions from activities at Santa Pod Raceway.

A set of Good Acoustic Design Principles for the site have been developed through close engagement with the Local Authority's Environmental Health Team. They dovetail seamlessly with the garden village principles that inform every aspect of the Colworth proposals and will ensure that noise from various sources is successfully mitigated.



2 Garden Village Principles

Garden Village

Overview of Traditional Garden Village

Garden village trends developed from the Garden City movement initiated by Ebenezer Howard in 1898, with the aim to capture the primary benefits of a countryside environment and a city environment, while avoiding the disadvantages presented by both. A number of garden cities have been built in the UK since then, including Letchworth, Brentham Garden Suburb and Welwyn Garden City and the concept has stayed influential in the UK ever since.

Objectives include:

- Holistic understanding of how a place will work
- High quality design, architecture and public realm creating a sense of pride and a sense of place
- A green setting, open land, recreation facilities, access to the countryside, excellent landscape and priorities for nature conservation (collectively we now call “green infrastructure”)
- A range of local jobs to create ‘community self sufficiency’ and to maximise self containment
- Excellent education, health and community facilities and convenient local shopping
- A socially diverse population housed in a range of housing types and tenure
- In-built ongoing responsibility and management to ensure enduring high standards.

Adopting Principles for Modern Living

Whilst this is an early twentieth century concept rooted in social equality, many of the historic settlements are now primarily celebrated as attractive and popular places to live that have adapted to conform to early twenty first century living patterns.

In recent years there has been a renewed interest in the idea of the garden city, and how the principles that underpin that idea can be used to inform the delivery of new communities today. When planning for the supply of new homes, local authorities are required by national policy to consider the garden city approach, and many local authorities, developers and housing associations are exploring opportunities to address housing and growth needs through new communities at a range of scales.

In January 2017 the Government announced its support for 14 new ‘garden villages’ – new communities of 1,500 - 10,000 homes which meet criteria set out in the 2016 ***Locally-Led Garden Villages, Towns and Cities*** prospectus. These projects are to be supported alongside ten larger ‘Garden Towns’.

Purpose

The purpose of studying the garden village model for the Colworth masterplan is to achieve a coherent masterplan based on holistic principles.

Colworth presents an opportunity to offer garden village principles suitable for its rural setting and landscape environment with a sensitive and appropriate design approach.

The best of the garden village principles, lessons and traditions will be taken forward and adopted to inform a new garden village that is unique for Colworth. The study allows the garden principles to be interpreted for modern living and the way people live today.

Approach to the Study

Selecting the Case Studies

A series of garden cities, villages and suburbs have been selected for the purpose of this study to inform Colworth. The locations cover a broad mix of population, scales, location and setting to provide a holistic view of garden village principles. A modern interpretation of a garden village has also been included as part of the study, as have villages local to Colworth.

The following locations have been selected and further detail of each location is provided on the following pages:

- Port Sunlight, Wirral
- Letchworth Garden City, Hertfordshire
- Hampstead Garden Suburb, London
- Souldrop
- Sharnbrook.

Approach to Assessment

Garden cities, villages and suburbs are holistically planned and therefore share a number of common themes and design principles. The following categories have been set out to inform the approach to this study:

1. Legibility

Layout, organisation and street pattern to study how the development has been arranged i.e. ribbon, linear or geometric.

2. Greenspace and Landscape

Types of green space and where they are located within the development, as well as landscape and boundary treatment.

3. Built Form and Scale

Scale of buildings in height and form, building typologies.

4. Architectural Style

The style of architecture and time it was built i.e. arts and crafts, proportions and roofscape.

The themes above provide an overview of strong design principles that can be taken forward to inform the design principles at Colworth.

Port Sunlight, Wirral

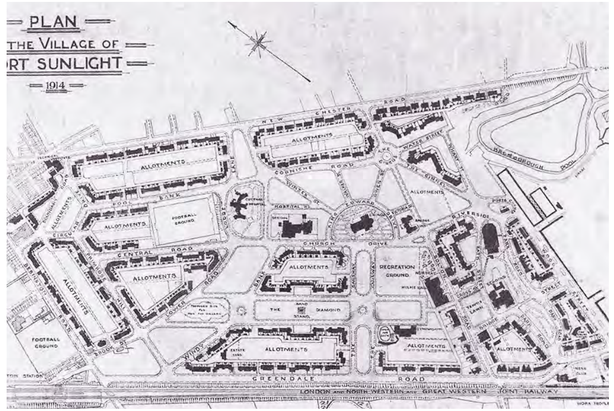
Overview

Port Sunlight is an exemplar village purpose-built by William Hesketh Lever of Lever Brothers fame (now part of Unilever), for his soap factory workers.

The garden village includes public buildings such as the Lady Lever Art Gallery, a cottage hospital, schools, a concert hall, open-air swimming pool, church, a temperance hotel and allotments. Almost all of the 900 houses and other larger buildings are Grade II listed and in 1978 the area was declared a Conservation Area.

The historical significance of Port Sunlight lies in its combination of model industrial housing, providing materially decent conditions for working people, with the architectural and landscape values of the garden suburb. Each block of houses was designed by a different architect.

Port Sunlight Village Trust is responsible for the conservation and promotion of the village.



Historic Map of the village of Port Sunlight, 1914

Dwellings
900

Area
53 ha

Legibility

1. Roads were made wide enough for the architecture to be enjoyed from the front elevation, rather than from an oblique view as in many towns. Streets follow a radial pattern, with a formal and symmetrical layout.
2. Perimeter blocks create a clear demarcation of private and public spaces. Cars do not dominate the street as they are parked off street and to the rear of properties, within the perimeter block, essentially creating central courtyards.
3. The green space is a key organising feature in the centre of the development and all streets connect to the central space. A key landmark building is situated at a central axis to terminate the primary vista, which creates a key focal point upon arrival.

2

Aerial view of Port Sunlight, courtesy of Google Maps

3

The Memorial at Port Sunlight, courtesy of Alex Liivet

Greenspace and Landscape

1. Open spaces and uniform front gardens are a feature of the village, although the present open character dates from the 1950s when railings that once enclosed the gardens were removed and a more municipal landscape plan was introduced.
2. Running water features are situated at the focus of central green spaces.
3. Street trees are planted in grass verges to create formal avenues.
4. All parks, gardens, monuments and memorials are managed by the Port Sunlight Village Trust (PSVT).
5. Two sections of the landscape - The Diamond and The Dell - are included in Historic England's Register of Parks and Gardens of Special Historic Interest.
6. Many of the public spaces are infilled and landscaped branch channels that once penetrated the site from the River Mersey.

2

2. Fountain in front of Lady Lever Art Museum at Port Sunlight, image courtesy of David McDonald

1

3

1. Port Sunlight Village, image courtesy of Pat Neary
3. Avenue at Port Sunlight

Built Form and Scale

1. Groups of individually designed houses spaciously arranged within parkland and set back from broad tree-lined roads.
2. The houses are grouped together in what are known as 'superblocks' which all face outwards and contain garage blocks and gardens in the centre.
3. Continuous buildings form a strong frontage along main routes. Massing is articulated with recessed walls and projected elements.

1

1. Port Sunlight Village

Architectural Character

1. A wide variety of styles were used, giving the impression that the village had developed over four centuries, rather than within 25 years.
2. No two blocks of houses are of the same design and nearly every period of British architecture is represented in revival style design - over thirty different architectural firms worked on designing the houses and Dutch, French and Flemish styles can also be seen.
3. Contrasting styles were often placed alongside each other to create interest, and no two cottages are identical.
4. The area contains a wealth of outstanding public buildings, most of which are listed.
5. Gable roofs, varied roof pitches and chimneys create a varied roofscape and interesting elevation.
6. Walls are articulated with recessed and projected elements.

1

2

3

2 and 3. Various residential streets at Port Sunlight Village

Letchworth Garden City, Hertfordshire

Overview

Letchworth was the world's first garden city, founded in 1903, five years after the publishing of Ebenezer Howards 'To-Morrow: A Peaceful Path To Real Reform', which sets out his vision for garden cities.

A masterplan was drawn up in 1904 by two Arts and Crafts architects from Buxton in Derbyshire, Barry Parker and Raymond Unwin, and they became Chief Consulting Architects to First Garden City Ltd, the design creating a distinctive early look in the town, and their housing layouts inspiring similar developments around the world.

Today the town is still owned and operated according to Howard's initial intentions.

Historic map of Letchworth Garden City

Population
33,249

Area
7.7 sq mi / 20 sq km / 5,500 acres

Legibility

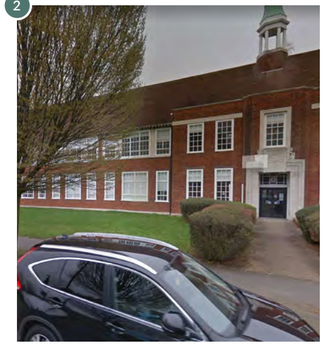
1. Street layout is in an axial layout with roads radiating out from a central square, based on Sir Christopher Wren's (never-built) plan for London, following the Great Fire of 1666.
2. Zoning of different types of building - industrial, commercial, middle-class and worker's housing.
3. Strong local cultural, recreational and shopping facilities in walkable neighbourhoods.
4. A formal and linear street pattern connects to the green space at the heart of the city.

1

1. Aerial Map of Letchworth Garden City, image courtesy of Google Earth

2 and 4. Street at Letchworth Garden City, Image courtesy of Google Maps

2



4

Greenspace and Landscape

1. Well connected and biodiversity-rich public parks, and a mix of public and private networks of well-managed, high-quality gardens, tree-lined streets and open spaces.
2. A large green space and park provide the focus of the city with buildings organised to address the space.
3. The green spaces run symmetrically with key buildings and features providing a strong focal point.
4. The park's landscape was designed to create a formal structure with a stately presence.
5. Tree-lined streets, each with a different variety of tree.
6. Surrounded by a rural belt.

1. Example of shared courtyard
2. Broadway Gardens Fountain
5. View along Broadway

Built Form and Scale

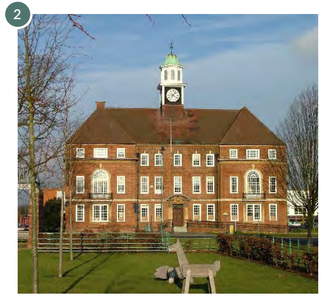
1. Distinct separation of residential, industrial and civic areas and the use of parks to screen residential neighbourhoods from roads and other undesirable sources of disruption.
2. There is a variety of building typologies present including larger detached buildings set back from the road behind large front gardens.
3. Terraced housing is carefully designed with a varied roofscape and projections to create presence and the statement of a larger building. These are often used to frame smaller green spaces.

Architectural Character

1a. 'Letchworth Look' housing inspired by Arts and Crafts movement, consisting of:

- (i) Roughcast white render cladding over bricks are applied to walls
- (ii) Red clay roof tiles
- (iii) Projected gables, dormer windows and chimneys add variety and richness to the buildings
- (iv) Recessed porches and projected gables

1, 1a, 2 and 3. Images of various housing typologies and gardens, images courtesy of Google Maps



Hampstead Garden Suburb

Overview

The initial idea of building a residential suburb for people of all incomes and classes began with Henrietta Barnett who set up a trust that bought land next to the newly built Golders Green station in 1900. Barry Parker and Sir Raymond Unwin, who already had experience from Letchworth Garden City, drew up plans for a new residential area - it was to be a social, as well as an architectural experiment.

The development of the suburb required a private bill before Parliament, as it was counter to local bylaws. The provisions of the new act, Hampstead Garden Suburb Act 1906, allowed less land to be taken up by roads and more by gardens and open spaces.

With no industry, no public houses and few shops or services, the suburb, unlike the original garden cities, made no attempt to be self-contained.

Historic Map of Hampstead Garden Village, Image courtesy of Hampstead Garden Suburb Trust

Total Dwellings
5000

Area
356 ha

Legibility

1. The sloping landscape was skilfully exploited to provide long range views, focal points and glimpsed views.
2. Particular care was taken to align roads, paths and dwellings to retain existing trees and views.
3. Closes and formal squares infill land between the main routes providing more intimate spaces and picturesque streetscapes.
4. Great care has been taken to vary the building line so that some houses are set back behind small greens whilst others step forward creating a sense of enclosed space and providing attractive views.

1. Aerial View of Hampstaed Garden Suburb, image courtesy of Google Earth

4. Typical Street at Hampstaed Garden Suburb, Image courtesy of Google Maps

3. Corringham Road North Square, Hampstead Garden Suburb, Image courtesy of Google Maps

Greenspace

1. Rich planting and landscape, retaining original trees and landscape features, often pre-dating the houses and retained in the masterplan to give maturity to the landscape.
2. The highest point is roughly in the centre of the original site and here is where the Central Square was developed as the formal heart of the new community with churches, public buildings and landscaped open space making a coherent and dramatic architectural statement.
3. Areas of woodland were retained as open spaces and generous provision was made for small greens, communal gardens, allotment areas and tennis courts. The flood land alongside Mutton Brook was integrated into the suburb as a park, recreational area and playing fields.
4. Hedges were chosen as the boundary treatment between houses, and this remains so today, lending the suburb a green, leafy quality unusual in urban development.

1. Green space at Hampstead Garden Suburb
2. Free Church, Hampstead Garden Suburb (1911 onwards)
4. Large detached houses with front gardens, image courtesy of Homes and Property

Built Form and Scale

1. Undivided houses with individual gardens are a key feature.
2. Ingenious grouping of buildings which reinforce a sense of community - houses designed to harmonise with each other and often grouped around greens, squares, walks and closes.
3. The range of housing is fundamental to the character of the suburb; it provides for a mixed community in age, household composition and income.

Architectural Character

1a. High quality building materials and traditional craftsmanship.

2a. Architectural features such as large or elaborate chimneys, dormer windows and bays designed to add variety and visual interest.

1a. Quadrangle housing, image courtesy of Julian Osley.

2a. Semi-private garden

3. Hampstead Way, image courtesy of Google Maps

Adopting Garden Village Principles for Modern Living

Principles to Take Forward

The study has highlighted key principles within garden village developments and the following will be taken forward to inform the Colworth masterplan.

- A **central greenspace** is typical of both garden villages and the surrounding local villages. It is often defined by a lawn with a water feature, with a local facility or public institution directly adjacent, looking onto it.
- Mature tree planting provides scale to the street scene with **grand avenues** on the main routes and large canopies creating enclosure and shelter on the minor routes.
- **Boundaries** vary, although there is consistent use of clipped hedging to define plots.
- The layout of the villages allows for long **views onto the green space**, as well as out.
- **Continuous, linear built forms** frame courtyards, becoming **perimeter blocks**; these allow for protection and seclusion of private outdoor spaces.
- Large buildings are arranged and designed to look like many continuous buildings.
- An **articulated building line** is achieved by staggering the placement of buildings.
- The **formal / symmetrical layout** aids legibility and organisation, allowing for effective use of land.
- **Framed streets** - the use of wide expansive promenades at the heart of the developments sets the green context and aids legibility, with large villas and terraces facing onto them.
- Homes and other buildings **overlook green spaces**, allowing for their longer daily activation.
- A **varied roofscape** achieved by gable roofs, projections etc. enhances the architectural interest of the village.
- New development may use some of these architectural cues to help **new and old** fit comfortably together.
- The study has highlighted that garden village **developments do not appear to soften at the edges** and there are many examples of increased storey heights and continuous frontage at the edges of developments.
- **Landscape and tree planting** is predominant and this is used to provide screening at the edges of garden villages.

Constraints

Garden villages are developments of their time and the world has changed since the first ones were built. It is important to consider the limitations of adopting the traditions and principles for modern development. The study highlights the following limitations of garden village principles.

- **Parking** is a clear issue for the modern day garden village. Many of the studied settlements now struggle to accommodate sufficient parking space, often resulting in rear garden spaces being converted to drives which impacts on the intended use of the central green spaces. However, at Colworth there is an opportunity to provide a new railway station, which could reduce the number of cars and traffic within the development, resolving this constraint.
- Garden villages suggest **density** to a development that may be impossible to recreate within a modern day housing development.
- **Traditional building styles**, whilst in keeping with the existing surrounding villages, may prove restrictive to future developments, lacking sufficient variety that could lead to anonymous neighbourhoods if used throughout the development.
- **Recreational open space** adjacent to housing may be unattractive to buyers if the correct type of visual and physical separation is not established.
- **Maintenance of green space** for many of these suburbs is now a fundamental issue, with little funds in place to manage the significant green infrastructure. Local associations are often in place to manage the areas, in addition to volunteer- and ‘Friends Of’ groups.

3 Existing Rural Context

Existing Rural Context - Souldrop

Images of traditional cottages at Souldrop

Souldrop

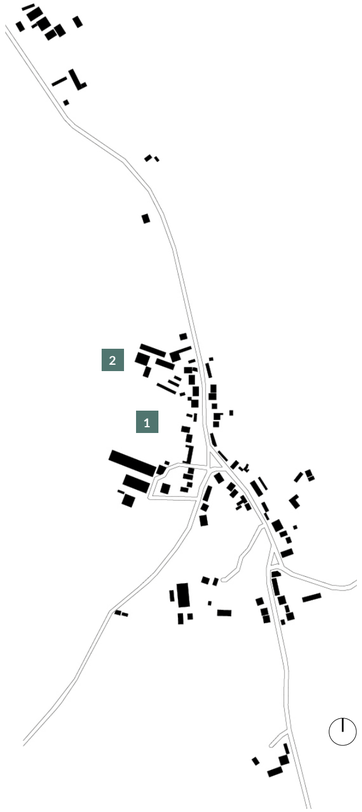
Souldrop is a small village of low density detached housing of a loose grain, which tightens with increased density around the village centre. Houses follow the linearity of the main road with a varied building edge to the north, characterised by farms. A local centre is focused around a village green that is also anchored by Knotting and Souldrop Village Hall.

Green verges, manicured hedges and historic stone walls help create a rural character within the village. The main building material is predominantly sandstone and red brick as building material. The village contains a number of model cottages built by the Duke of Bedford in the middle of the last century; there are still a few thatched cottages.

Souldrop provides a strong example of how more rural clusters can be created around key buildings, including chapels and churches, along with variations in character and density. The surrounding rural landscape sympathetically integrates and softens the edges and lanes of the village settlements.

Total Dwellings
117
(with Knotting)

Area
460 ha
(with Knotting)



Existing Rural Context - Sharnbrook

Sharnbrook

Situated just north of a loop in the River Great Ouse and almost due north of Bedford, the village has developed as a ribbon-settlement running southeast to northwest, with the core of the community clustered at the northwestern end.

The village contains a primary school and secondary school and a number of shops, churches and leisure centres.

Many of the buildings in the village are constructed with local limestone, typical for traditional north Bedfordshire settlements. Houses often sit close to the road, with large courtyards in the back, emulating previous farm building clusters.

Mature trees, generous green verges and manicured private gardens behind historic stonewalls add to the rural character.

Whilst there are large areas of 20th century standard suburban development that are less relevant to this study, the traditional character of the high street has been retained with particularly good quality examples of rural courtyards and barns, albeit with some lesser quality mid-20th century infill.

Overall, the size, area and quantum of facilities within Sharnbrook, provide a good benchmark for the villages of Colworth.

Typical Street at Souldrop Village

Total Dwellings
947

Area
979 ha
(with Sharnbrook Parish)

Existing Rural Context - Heritage Assets

EDP has undertaken a Heritage Impact Assessment to consider the potential effects of Colworth Garden Village on the heritage assets in the local area. This has been submitted to the Council separately. A list of assets were identified in collaboration with Bedford Borough Council Officers and include the Grade II* listed Colworth House and its associated Grade II lodges, Grade II Antonie Farmhouse, Grade II listed New Farmhouse and Grade II* Church of All Saints at Souldrop, Bedfordshire.

Despite the large scale of the site, landscape and visual assessment has established that it is visually well contained, and as such, for the most part, the site's wooded boundaries, particularly on its southern edge and the railway to the north-east, screen views into the site from the various heritage assets. Views from the neighbouring settlements of Sharnbrook and Souldrop are extremely limited, although it is acknowledged that there are views from the south-western edge of Souldrop.

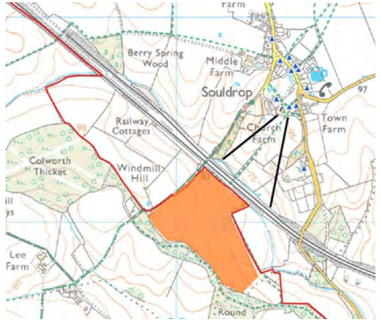
The only asset where open land at the site makes a contribution to its significance is considered to be the Grade II* listed Church of All Saints at Souldrop (1159751). Views are possible from the church, including from its entrance porch, looking out across pastoral land down to a row of trees which lies adjacent to the Midland Railway. Beyond the railway are fields that are a part of the proposed development site. The extent of the view halts at a band of trees which form a belt along the crest of the opposite valley sides.

The church's setting to the southwest comprises countryside that reflects its historic setting on the edge of a rural village and across which, on account of its openness, the church is prominent, although the countryside character of the view has diminished on account of the modern railway line and its overhead electrical lines. Furthermore, historic map evidence from the 19th century indicates that the land on the site was part of a land holding associated with the church and its rectory. This association is degraded by the division of the land by the railway line.

Nevertheless, it is concluded that the visible land to the southwest makes a positive contribution to the church's significance, with the greatest contribution from the large pasture that is nearest to the church. Part of the site forms the more distant fields in this view, and is therefore part of the church's setting, although partially screened by intervening trees. The assessment concludes that this part of the site makes a minor positive contribution to the significance of the church through the appreciation it allows of the asset's historical wider agricultural setting.

View from Church of All Saints graveyard, at Souldrop

View from Church of All Saints graveyard, at Souldrop



Plan showing location of viewpoint from Church of All Saints, Souldrop

View from Church of All Saints graveyard, at Souldrop

4.0 Acoustic Context

National Policy and Guidance

Noise Policy Statement for England

The Government's noise policy is set out in the Noise Policy Statement for England. The Government's noise policy sets three aims, which are to be met within the context of the government policy on sustainable development:

- To avoid significant adverse impacts on health and quality of life
- To mitigate and minimise adverse impacts on health and quality of life and
- Where possible, contribute to the improvement of health and quality of life

The National Planning Policy Framework

The National Planning Policy Framework, in paragraph 180, states "Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development In doing so they should:

A Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development and avoid noise giving rise to significant adverse impacts on health and the quality of life;

B Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason and;

C Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."

Planning Practice Guidance - Noise

The Professional Practice Guidance on Planning and Noise for new residential developments (ProPG) was produced to provide practitioners with guidance for approaching the issue of noise in the planning system, and achieving sustainable development by following 'good acoustic design' as a holistic process. The document does not constitute an official government code of practice nor does it provide an authoritative interpretation of law or government policy.

ProPG advocates a systematic consideration of four key elements:

1. Demonstrating a 'good acoustic design process';
2. Observing internal noise level guidelines;
3. Undertaking an external amenity area noise assessment; and
4. Consideration of other relevant issues.

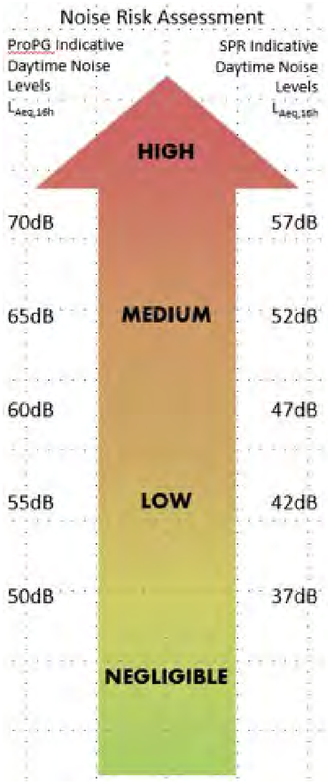
The approach includes preparation of an 'Acoustic Design Statement' (ADS) which for a high risk site is expected to be appropriately detailed. The design should reflect comprehensive consideration of relevant steps to achieving acceptable conditions, including:

- Optimal planning and layout of the site. For example, landscaping features and / or a layout which takes advantage of the self shielding effect of buildings to provide shelter to main living spaces and external amenity areas.
- Orientation of the proposed buildings. For example, locating bedrooms on shielded elevations.
- Detailed examination of building element.
- Performance and ventilation and cooling strategies, enabling openable windows and passive ventilation provision as far as possible

ProPG Noise and Risk

ProPG presents a risk scale for the assessment of environmental noise conditions based upon generalised, indicative noise levels. Given the particular character and type of the noise from Santa Pod Raceway, these indicative noise levels will be adjusted to take into account current guidance and precedent on penalties and assessment criteria.

The following figure is based upon the scale presented in ProPG, and adjusted to account for noise penalties resulting from the distinctive character of the noise from Santa Pod.



ProPG site risk scale for the likelihood of adverse noise effects

Supporting Standards and Guidance

- Code of Practice on Environmental Noise Control at Concerts
- IEMA Guidelines for Environmental Noise Impact Assessment
- BS8233 Guidance on sound insulation and noise reduction for buildings
- WHO Guidelines for Community Noise
- WHO Night Noise Guidelines for Europe
- Acoustics Ventilation and Overheating Residential Design Guide
- CRTN
- CRN
- BB93 Acoustic Design of Schools.

Potential Effects of Noise on People

The development of an approach to assessment will be led by understanding and assessing the potential effects of noise on people's health, wellbeing and quality of life. The potential effects of noise on people in and around their homes are outlined below.

Noise Annoyance

Noise annoyance is a term used to describe a range of negative reactions to noise by groups and individuals. Noise annoyance is subjective in nature and varies due to acoustic characteristics of the noise (e.g. noise level and sound character) and non acoustical factors (for example social or economic factors). Additionally, sensitivity to noise is dependent on the individual but it is usual to assess noise annoyance at a group (or community) level as there is a greater correlation between noise exposure and annoyance at a community rather than individual level.

Sleep Disturbance

Sleep disturbance is a major environmental noise effect on health and wellbeing. Primary effects are identified as difficulty in falling asleep, awakenings or alterations in sleep stages. Assessment typically considers night time using guidance from World Health Organisation. Events at Santa Pod do not extend beyond 23:00.

Speech Interference

Speech interference is essentially a masking process in which simultaneous interfering noise renders speech incapable of being understood. People with hearing impairments are particularly affected as well as the elderly, children in the process of learning languages, and individuals who are less familiar with the spoken language.

Disturbance to Activities

Noise can distract individuals and has the potential to affect cognitive task performance especially for complex tasks that require attention to detail. In children, noise can impair cognitive behaviours and therefore can have a negative effect on teaching and learning activities in a school environment. Although less established in terms of research, distraction and disturbance to adults will be considered in the assessment, in consideration of potential future increases in the population permanently working from home following the coronavirus pandemic.

The Existing Noise Climate

Transportation Noise

The Midland Main Line railway line runs along the northeast boundary of the site providing rail services between Bedford and Wellingborough.

A survey of transportation noise was undertaken on the site in 2016 and 2017 that included noise measurements at around 10m from the railway line.

Although the levels of noise measured were significant, they are typical of those experienced by developments adjacent to existing railway lines where acoustic solutions have successfully been employed to minimise disturbance from passing trains.

Noise exposure from rail traffic is well understood and has established noise assessment methodologies.

The A6 is the largest trunk road near the site, located to the east approximately 1km beyond the railway line The rest of the site is surrounded by the local road network, often at considerable distance from the proposed development. Given the large distances from the site, road traffic noise is not anticipated to be a problem for the development. Several airfields are located nearby the development; Tower Farm Airfield, approximately 5km to the northwest of the site; Sackville Farm Airfield, approximately 5km to the northeast of the site; Bedford Aerodrome, approximately 7km to the East of the site;

Earwig Farm Airstrip, approximately 5km to the southeast of the site and Easton Maudit Airfield approximately 8km to the west of the site are the closest.

The site will experience noise from occasional light, recreational aircraft movements, but this is not anticipated to be a problem for the development.

Santa Pod Raceway

The main source of noise near to the site, and therefore the focus of the noise considerations, is the Santa Pod Raceway, which is situated immediately adjacent to the west of the Colworth Garden Village development site. Santa Pod is the UK's only Federation Internationale de l'Automobile sanctioned facility and has consent to conduct motorsport activities 365 days of the year between the hours of 09:00 and 21:00. At present, Santa Pod Raceway holds the majority of events during the racing season between March and September, but non competitive events run for longer between February and November. The events fall into one of three broad categories, these categories are:

- Drag racing
- Car enthusiast
- Festival style

Measurements of the noise from Santa Pod Raceway have been undertaken for a number of events during the 2019 season in order to robustly establish the profile of noise typical of different event categories at the motorsport venue.

The event noise profile and type of sound emitted by each of the three categories varies in level, character and duration. Drag racing events are often sanctioned competition motorsport events comprising racing of dragsters, professionally modified cars and jet cars, often spread over a number of event days.

Festival style events are undertaken over multiple days, usually a long weekend, but comprise of many shorter attractions centred around motorsport, stunt vehicles, funfairs, merchandise traders and live and DJ based music.

Car enthusiast events are usually one day events, often held during normal working hours, which focus on a limited range of specific motorsport activities.

A Rural Acoustic Setting

For the majority of the time when there are no events underway at Santa Pod Raceway the development site is situated within a relatively peaceful, natural environment with low background noise levels.

Sound levels during the daytime are typically below 50 dB(A) across the vast majority of the site. The acoustic environment consists of some transportation noise present from the road and rail network, as described earlier. This transportation noise only really affects small areas along the eastern and southern sides of the site, with the remaining areas experiencing low ambient sound levels with a high proportion of natural sounds, such as birdsong.

The existing acoustic environment supports a garden village theme by offering a high quality soundscape for people to live and work within, complimenting a rural, peaceful and restorative theme.

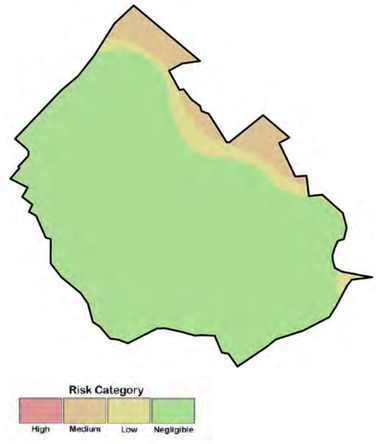
A soundscape like this is well suited to activities that require a restorative home atmosphere to improve health and wellbeing, or where there is a need for concentration such as learning and development.

> "The existing acoustic environment supports a garden village theme."

The Professional Practice Guidance on Planning and Noise for new residential development (ProPG) presents a risk scale for the assessment of environmental noise conditions based upon generalised, indicative noise levels from sources such as road and rail traffic.

The figure (right) is based upon the risk scale presented in ProPG, given that between events at Santa Pod Raceway the ambient noise across the site is dominated by road and rail traffic.

During the night time period, sound levels are typically very low, which is well suited for residents to sleep and rest within.



ProPG site risk for noise during non event days

Santa Pod Raceway Event Noise

Raceway Events

Measurements of event and non event day noise levels across the development site have been made in 2016, 2017 and again in 2019. The noise survey undertaken in 2019 was very comprehensive, measuring levels continuously at six locations across the site at different distances from Santa Pod Raceway. The measurements were undertaken over two months between Thursday 18th April and Wednesday 19th June, including 7 track days, 10 show days, 4 festival days (the FIA Main Event) and 5 drag racing days.

Although broadly grouped into three classes of event, different types of motorsport activity operate at the venue throughout the year.

Drag Racing

These events are spread throughout racing season from March to September. Ten large competition events are typically held throughout the season with around 40 days of loud drag racing in total per year.

Jet Car

The Santa Pod Jet Car runs at 28 events during the season and, at bigger events, is joined by other jet cars, amounting to around 100 runs over the season.

Ultimate Street Car (USC)

This is an annual, festival style event that takes place in August over 3 days. It includes a main stage featuring live music from 19:30 to 23:00 and DJ based music inside a marquee from 20:00 to 01:00.

FIA

This is Santa Pod's main festival style, competition racing event held over 4 days early into the drag racing season. It is well attended and televised, featuring drag racing across most vehicle classes.

Bug Jam

Alongside the racing are circus attractions, exhibition vehicles and stunt shows, live and DJ based music. This is one of Santa Pod's largest, festival style events that is held annually over three days towards the end of July. It includes drag racing, live music and night time entertainment. There is an outdoor main stage for live music between 19:30 and 23:00 and two big top marquees with DJs performing from 20:00 to 01:00.

Drift

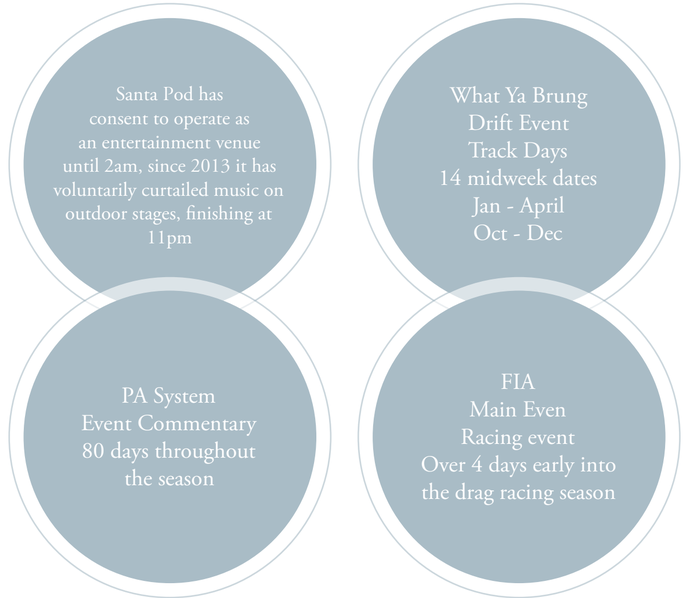
What Ya Brung - like RWYB events, DWYB events are track days open to the public and typically occur on 14 midweek dates throughout January to April and October to December. Drifting is a driving technique that involves intentionally oversteering a vehicle around a corner maintaining control while the vehicle looses traction with the track. Drifting often takes place at several locations at once during these events.

Amplified Music

There are around 10 events each year that host live outdoor music performances. Santa Pod own a mobile outdoor stage that is used at eight of these events, with around two larger annual events where a number of temporary stages are erected. Santa Pod has consent to operate as an entertainment venue until 02:00, but since 2013 has voluntarily curtailed music on outdoor stages, finishing at 23:00. The venue operates a self policing noise control management system at all events that involve external music entertainment that continues into the evening.

Public Address System

Event commentary takes place on more than 80 days throughout the season. The main commentary system faces the stands to the left and right of the track. A smaller, distributed system also allows announcements to pit areas and hospitality venues to provide operational information and safety notices to all event spaces.



Typical Event Day Noise Profile

Noise profile for events at Santa Pod Raceway vary depending upon the scale and nature of the event. Track day events typically start early and run throughout the day, focusing upon the motorsport activities. While festival events revolve around motorsport, they also include funfair attractions, shows and music that might continue, without the motorsport activities, into the evening and night over the course of a long weekend.

Event Kick Off

For one day events at Santa Pod Raceway there is typically a period in the morning when the event begins where noise levels begin to increase as motorsport activities and hospitality venues start operating.

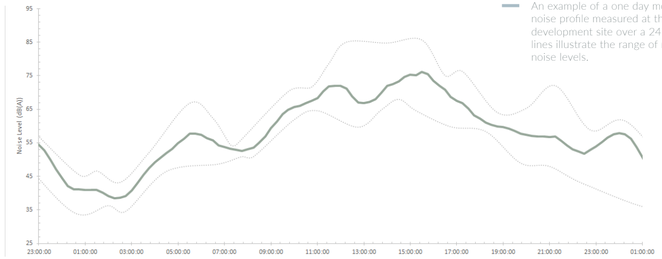
Main Motorsport Event

The main motorsport events typically run from mid morning through to 21:00 at the latest, although some track events can finish earlier, so the track activities could reduce throughout the late afternoon into the early evening.

Motorsport activities and the event shows often have the potential to produce sudden loud, impulsive noises or noises within a narrow range of frequencies. The potential for these effects to occur is considered as part of the site noise risk assessment,

Hospitality and Entertainment

Santa Pod events provide hospitality into the evening, particularly for festival events where visitors may camp overnight at the venue. Visitors are encouraged to stop music and entertainment noise of their own at 23:00 which aligns with when Santa Pod finish the live music events. For larger festivals, amplified music may continue until 01:00 or 02:00 inside big top marquees.



An example of a one day motor sport event noise profile measured at the north end of the development site over a 24 hour period. The dashed lines illustrate the range of measured short term noise levels.

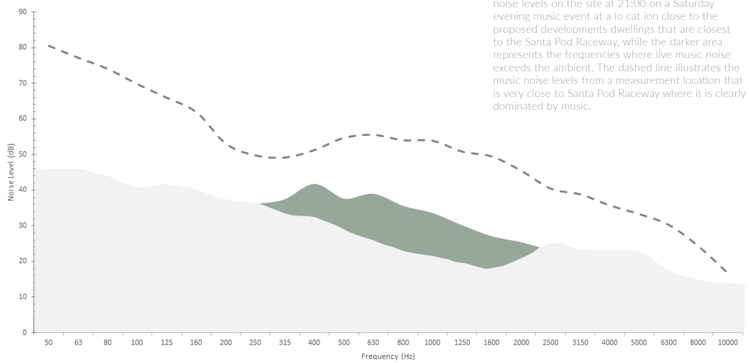
Music noise can often be identified by a raised level of low and mid frequency noise across the site

Noise from Music Events

Santa Pod Raceway hosts around 10 large events a year which include live music on outdoor stages. These events tend to run over 3 to 4 days of a summer weekend, with outdoor music finishing at around 23:00. Music noise can often be identified by a raised level of low and mid frequency noise across the site. Figure 11 below illustrates that the western side of the development site closest to Santa Pod will likely experience music noise levels that are higher than the ambient noise levels in the mid frequency bands between 300Hz and 2KHz.

Event Calendar

Santa Pod Raceway hold 10 events per year that host live music on outdoor stages. Their own mobile outdoor stage is used at 8 of the events, and larger temporary stages are brought in for the 2 larger events. Amplified music is permitted until 02:00 but music levels on outdoor stages are reduced after 23:00.



The light grey, solid area represents the ambient noise levels on the site at 21:00 on a Saturday evening music event at a lo cat ion close to the proposed developments dwellings that are closest to the Santa Pod Raceway, while the darker area represents the frequencies where live music noise exceeds the ambient. The dashed line illustrates the music noise levels from a measurement location that is very close to Santa Pod Raceway where it is clearly dominated by music.

Larger events

Music is a focus at 2 of the larger events in the calendar, Ultimate Street Car and Bug Jam. Alongside the outdoor stages, big top marquees are erected on the site, with dance music DJ sets running until 01:00. The music noise levels above do not represent these larger music events as they did not occur during the extended 9 week survey period.

Measurements

Noise from music can be identified from a large peak in low frequency in the measurements closest to Santa Pod Raceway. Locations further away from Santa Pod Raceway show a considerably flatter frequency response with less low frequency energy.

Santa Pod Raceway hosts around 10 large events a year that host live music on stage

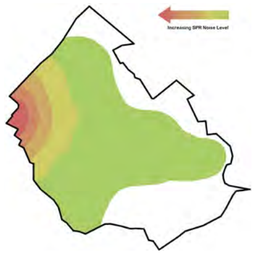
Typical Event Classification Noise Levels

The typical noise levels experienced across the development site for each event classification will vary in relation to the scale and nature of the event. Competitive events typically result in the lowest average daytime noise level, while festival events that continue into the evening and night result in the highest noise levels from the venue. The figures below relate to an open site, without the development, and so present a worst case illustration of how noise propagates across the site. With the development, the locations further into the site will experience screening from the intervening buildings, so noise at these locations will likely be lower than suggested below. Mitigation measures are discussed in more detail in Chapter 5.

Drag Racing

Santa Pod Raceway is an FIA sanctioned motorsport venue and hosts many competitive drag racing events throughout the season. Although hospitality and entertainment are provided at these events, it is at a much smaller scale than other events, instead focussing more on the motorsport. The daytime noise levels from these activities are generally the lowest of the event classifications as the noise sources are more intermittent with periods of lower noise between races.

The noise created by dragster and jet vehicles is very high, so the racing parts of these events will be the most noticeable on the site. However, each race will be over reasonably quickly and will be followed by periods of lower noise before the next race.



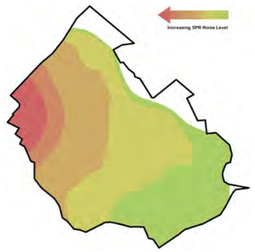
Car Enthusiast

Car enthusiast events usually involve vehicles brought to the venue by members of the public. Consequently, these vehicles are generally quieter than the dragsters, jetcars and show vehicles popular at festival type events. However, the enthusiast days involve more continuous motorsport activities, allowing the participants the freedom to use the facilities as much as they like. The average daytime noise levels are generally slightly higher than the competitive event days due to this more continuous noise level.

Festival

Festival events are by far the busiest events in the Santa Pod Raceway calendar. Festivals, funfairs, motorsport and music entertainment throughout the day and evening and amplified music often continues into the night inside the big top marquees. The events host many attractions, so have the largest numbers of noise sources operating at the same time, generally for more continuous periods throughout the day. However, these events occur least frequently, with around 2 to 4 festivals per year .

Unlike the other events, festivals have music noise that continues into the evening and night. The nature of amplified music means that the low to mid-frequencies could be noticeable above the ambient noise across the site, particularly at locations closer to the raceway.



Typical noise levels indicative of each event classification based upon a daytime average noise level from the motorsport venue noise.

Drag Racing noise is the lowest level of the event classification

Santa Pod hosts 2 to 4 festivals per year

Car Enthusiast average daytime noise levels are generally slightly higher

ProPG Assessment

The use of good acoustic design is an inherent part of the design process for the Colworth Garden Village site. This process comes from the ProPG guidance. Whilst ProPG does not directly apply to the type of noise activities that occur at Santa Pod Raceway, the design process and approach is clearly relevant. By combining good acoustic design with a comprehensive understanding of the local acoustic environment and the likely perceived soundscape, a robust procedure can be followed to ensure that a sustainable development is created that is appropriate for residential use and supports the health and wellbeing of those who would live or work in the area.

Stage 1 provides an initial noise risk assessment across the site.

Stage 2 provides a systematic consideration of the important acoustic elements:

- Element 1 demonstrating a "Good Acoustic Design Process";
- Element 2 observing internal "Noise Level Guidelines";
- Element 3 undertaking an "External Amenity Area Noise Assessment"; and
- Element 4 consideration of "Other Relevant Issues".

To complete the second stage effectively, the site is broken down into three development zones that correspond to different noise exposures due to their location. By breaking the large site of the proposed development down in this way, the design can ensure that suitable mitigation can be effectively applied where it is needed with due consideration to the setting and the masterplan requirements.

A set of good acoustic design principles are then created for the different development zones, founded upon:

- Providing a suitable acoustic environment for people to live, work and play within;
- Observing the latest noise level guidance and research in order to support people's health, wellbeing and quality of life; and
- Providing a sustainable development that is considerate of the environment as well as local issues and factors.

This section of the report constitutes the acoustic design statement for the proposed Colworth Garden Village.

Site Plan Noise Risk Assessment

A site wide noise risk assessment has been completed based upon the noise levels measured during different event days of the 2019 season. This noise risk assessment focuses on the noise from event days at Santa Pod Raceway. This initial assessment is used to provide an indication of the likely risk of adverse effects from noise on the site. It is completed with no mitigation included as part of the development proposal and neglecting the inherent self screening provided by the proposed new buildings.

Pro PG provides indicative noise levels to use in such a risk assessment. For this noise risk assessment a penalty has been applied to the noise level risk criteria to take account of the sound character during events, which could be viewed as being impulsive and tonal for some activities. These noise characteristics are more likely to cause annoyance than sound without such characteristics, such as normal road traffic.

To account for this a more stringent overall noise level has been applied. The risk categories set in ProPG have had a 13 dB penalty applied to them. This penalty has been adopted from the procedure for assessing tonal or impulsive sounds documented in BS 4142. BS 4142 provides guidance on determining rating levels for sound sources of an industrial and / or commercial nature relevant to proposed new residential buildings.

Whilst BS 4142 does not set out a method for the assessment of motorsport sound sources, its process for applying an adjustment for the characteristic features of the sound is relevant to this initial risk assessment stage. This approach has been discussed with the Bedfordshire Borough Council Environmental Health team.

Pro PG Indicative Noise Levels L Aeg, 16hr	Penalised Noise Level Limits L Aeg, 16hr	Risk Category
>70 dB	>57 dB	High
60 to 70 dB	47 to 57 dB	Medium
<60 dB	<47 dB	Low

Table 1

Pro PG noise level limits and the penalised noise level limits used for for each Risk Category used in the noise risk assessment The Noise Levels are based upon 15 minute measurements during the daytime period using the LAeq metric to provide an equivalent sound level.

Having subjectively reviewed a range of sounds from different Santa Pod Raceway activities, broadly speaking the sounds can be considered as having clearly perceptible tonality (resulting in a 4 dB penalty) and being highly perceptible in terms of impulsivity (resulting in an additional 9 dB penalty).

Extract from BS4142

Tonality

For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.

The noise measurements of Santa Pod Raceway event days used in the risk assessment are an average of those taken during the daytime period of a number of different events from the extended survey period. Table 2 also shows the typical range of noise levels for the different event days measured.

All event noise levels have been compared with the ambient sound levels on non event days in order to see if the noise from Santa Pod Raceway is actually the dominant source at the different measurement locations.

This has identified that at locations 4 and 5 the sound levels measured during event days are the same as those measured on non event days. This shows that within this easterly area the noise from activities at Santa Pod Raceway is not the dominant source. For these locations Pro PGs original noise level limits are applied without penalisation and the risk of adverse effects on dwellings in this area is considered to be low.

Location	Event day noise levels	Average noise level measurements during event days	Average ambient sound level measurements on non-event days	Risk category
1	65-71 dB	69 dB	50 dB	High
2	43-47 dB	48 dB	45 dB	Medium
3	46-49 dB	49 dB	44 dB	Medium
4	43-53 dB	47 dB	47 dB	Low*
5	46-52 dB	49 dB	49 dB	Low*
6	46-55 dB	50 dB	47 dB	Medium

Table 2

Illustrates the range and average noise measurement levels for the different survey locations across the site and the corresponding risk category assigned to them. The sound values are 15 minute measurements during the daytime period using the LAeq metric to provide an equivalent sound level.

Key

1 Unattended survey positions

Santa Pod Raceway

Proposed development boundary

It is important to note that this risk assessment simply presents the likelihood of adverse effects from noise occurring across the site in its current, unmitigated open form. It does not account for any screening by buildings or the fact that noise events occur infrequently and irregularly. This will be considered in the detailed assessment stage.

The range and average noise measurement levels for the different survey locations across the site and the corresponding risk category assigned to them The sound values are 15 minute measurements during the daytime period using the LAeq metric to provide an equivalent sound level.

Noise Level Guidelines

The second stage of the ProPG assessment is ongoing and the following details the work completed to date that have led to our design response.

The assessment approach is underpinned by the aims of:

- Achieving places within which people can live and work to good effect with a minimum risk of potential negative effects of noise; and
- Providing a positive local soundscape, well suited to the expected uses of and activities within spaces.

Noise Level Guidelines

Element 2 of ProPG requires the assessment to observe internal "Noise Level Guidelines". The World Health Organization,

BS8233 and Pro PG provide guidance on noise levels for residential development and these are presented in Table 3.

It is important to recognise that these guidelines are typically applied to more constant noise sources such as road traffic, and so further consideration will be needed for assessment of Santa Pod Raceway events.

For the majority of the time, the typical ambient noise levels across the proposed development are expected to easily achieve the target internal noise levels in dwellings with windows open, and the potential effects of noise annoyance and sleep disturbance are minimal.

The majority of events at Santa Pod occur during the daytime period with racing event days typically ending at either 17:00 or 20:00 hours depending upon the particular event. During these events the noise is not expected to present a significant risk of sleep disturbance.

The noise from Santa Pod Raceway has been described in terms of its characteristics earlier in this chapter, on page 42. Whilst these characteristics are expected to present a likely increase in noise annoyance it is also recognised that the frequency of occurrence of activities is relatively low. There would therefore be periods of time when people within the development will be provided with extended periods of respite from the potentially more annoying elements of noise.

In response to the above points, it is proposed that the specific noise from Santa Pod be assessed through a more detailed appraisal of short duration noise levels from specific event activities.

Ultimately, it is essential that good acoustic design practice is applied through the development of design principles that form an Acoustic Design Statement in order for internal noise levels within dwellings to be achievable. Consideration of the noise character is a fundamental part of these design principles.

Environment	LAeq (dB)	Time period (hours)	LAmax (dB)	Potential effect
Outdoor areas	50-55	07:00-23:00	-	Noise annoyance
Indoor living areas	35-40	07:00-23:00	-	Noise annoyance
Indoor bedroom	35 30	07:00-23:00 23:00-07:00	- 45 (Outdoor)	Sleep disturbance

Table 3
Indicative noise levels suitable for residential dwellings and the potential effects that noise events above these levels could cause

External Amenity Spaces

Element 3 of the Pro PG process is to assess the noise within external amenity spaces provided for dwellings. The daytime ambient noise levels across the site on days when Santa Pod Raceway events are not taking place will typically be below 50 dB L aeq and very suitable for a residential development that can provide a good living environment in terms of health and wellbeing.

On event days, for the closest dwellings to the Santa Pod Raceway the external noise levels in private amenity spaces are likely to exceed the preferred noise levels of 50 55 dB during event activities. The noise climate of a typical event day has been shown in section 2 for this area. Some improvement can be made through building arrangements, winter gardens and courtyards. However, it is still expected that some short term noise levels from particular Santa Pod Raceway events, including intermittent impulse sounds, will be clearly audible above the background ambient sound level.

Short,impulsive sounds could potentially disrupt or distract people from their social activities. They are less likely to interfere with normal speech outdoors due to this very short duration. Short motorsport activities during events such as high performance cars operating on the strip have the potential to produce noise that may temporarily interfere with speech at the very closest dwellings

on the proposed development. Whilst it is important to acknowledge the varying noise levels during event days, it is equally important to acknowledge that there are a considerable number of days per year that have no events and this will naturally provide periods of predictable respite for residents in all external amenity and recreation spaces within the proposed development.

Other Relevant Issues

Particular consideration is being paid to the schools that form part of the proposed development. Their exact locations and orientation is yet to be decided and options of moving schools from their current location on the concept plan are being considered.

The design of schools requires consideration and suitable noise mitigation could include:

- Spatial separation of the school from Santa Pod Raceway;
- Building orientation to provide protection to external spaces that are used for teaching and learning activities in the form of courtyards; and
- Increased specification of façade construction and glazing.

Noise Management Strategy

The current masterplan has been developed with careful consideration of the identified noise sources, particularly the noise emissions that occur on the days when Santa Pod Raceway hosts events.

Spatial Separation

As far as possible the separation distance between the development plots and the Santa Pod Raceway will be maximised.

This creates an opportunity to incorporate into the development a large open Country Park that can be used for outdoor amenity by the local community.

Landscaping, Walls and Fences

Combinations of landscaping features, like bunds and embankments, walls and solid fences, can be used to create screened areas with greater noise protection from the Santa Pod Raceway events.

Landscape bunds could be an effective screen around the site perimeter. Walls and fence barriers can used to maintain the continuity of buildings to provide local areas of noise protection to gardens and private external amenity spaces.

Green walls can be used to provide a holistic set of benefits to the development. In terms of acoustic design they offer a degree of sound absorption as well as the more obvious acoustic screening provided by the barrier itself. These systems can also provide a positive impact on air quality and biodiversity. They can have a positive social impact as well by enhancing the built environment and provide an additional visual link to the natural environment, with seasonal variations in colour, texture and flowering.

Building Layouts

The arrangement of the buildings and development plots, particularly around the perimeter of the development site, can be oriented to create screening to reduce the noise propagation through to the site as much as possible, protecting the plots behind them.

The ancillary buildings (e.g. garages) can be arranged around external amenity spaces to create courtyard areas screened from Santa Pod Raceway noise.

Building Orientation and Space Planning

For residential buildings with noise sensitive rooms, the internal layout of buildings can be arranged such that the sensitive rooms are on the quietest façades while less noise sensitive spaces (e g corridors, stairwells and bathrooms) can be located along the most exposed façades.

The following chapter describes in further detail how the above approaches to noise mitigation will be sensitively incorporated into the masterplan and context without compromising on design quality and placemaking.

5 Design Response

Colworth Garden Village

The masterplan is underpinned by good placemaking principles, as well as the values and principles of the traditional garden villages. The masterplan includes the following:

1. **Central village green** - Forms the heart of Colworth Garden Village, all streets and routes connect to this space bringing together the villages. This space is for the whole community to enjoy, designed to encourage activity, creating a vibrant heart to the community with space for community events, play for children and seating areas for activities such as picnics.
2. **Woodland edges** - The edge of the development will be wrapped with the existing woodland that anchors the development into its setting. The mature landscape setting creates an area for landscape and wildlife to be enjoyed and accessed by everyone. There is a unique opportunity to create outdoor living at Colworth.
3. **Landscape bunds** - Areas of raised landscape bunds and planting will provide viewing areas surrounding the site. They form a multi-purpose function of noise mitigation, an opportunity for long distant views to the countryside and an area of biodiversity and wildlife habitat in the form of meadows. A series of informal footpaths and wetland will weave between the raised landscape bunds to promote walking, cycling and connections throughout the development.
4. **Green streets and avenues** - This is a key principle in garden villages which will be adopted at Colworth. A legible network of streets aid navigation and wayfinding. Primary streets will include grass verges and footpaths lined with street trees either side of the carriageway.
5. **Semi-private courtyards** - Courtyards are a key feature within garden villages and this will be taken forward and incorporated within the Colworth masterplan. The courtyards will vary in scale and will be appropriate to the building heights that surround it.
6. **Strong building line** - A common feature within garden village developments is a strong continuous built form enclosing courtyards and green spaces to create an intimate and protected environment. At Colworth this principle has been applied to frame courtyards and protect amenity space from noise.
7. **Semi-private green** - A distinctive feature within many garden villages is the U-shaped semi-private green space that allows dwellings to benefit from green views from any part of the village adding amenity value to the development. The intimate green space creates an opportunity for children to play safely, close to their homes with the benefit of overlooking dwellings.
8. **Linear green park** - An organising feature central to the garden village is the linear green park. This is a tree lined linear green space that provides a strong connection throughout the development that all routes connect to. At Colworth the linear green park runs east-west through the village and provides a variety of functions such as drainage, play and amenity, as well as green views from overlooking dwellings.
9. **Play space** - Children's play space is provided throughout the development within walking distance of dwellings. Play spaces will be designed to be inclusive to all and will be located at key nodes and along walking routes, overlooked by dwellings to create a safe environment for children.
10. **Formal gardens** - Garden villages incorporate water features within formal landscape designs to form a focal point within a landscape space. At Colworth water features provide sound scaping throughout the development.
11. **Boundary treatment** - Buildings along avenues will be set back with large front gardens bound by hedges.
12. **Building typologies** - A range of building typologies and homes will be designed for modern living, to include apartments and family homes offering a lifetime neighborhood for residents.

Sketch Illustrative Concept Masterplan, Zone 1 and 2

Development Zones / Character Areas

Acoustic Mitigation Measures

A series of acoustic mitigation measures have been developed to control internal and external noise levels for the proposed development at Colworth. These measures are summarised below and this chapter describes the measures in further detail and the location where they have been applied.

Spatial separation from Santa Pod

Maximising as far as possible the spatial separation between the development and Santa Pod Raceway.

Noise barriers and landscape bunds

Incorporating noise barriers and landscaping bunds as part of the scheme to screen the development from Santa Pod.

Urban design / building layout

Using the layout of the scheme to reduce noise propagation as much as possible beyond the first row of buildings.

Protection of outdoor living and amenity spaces

Using the masterplan layout to provide noise barrier effects to outdoor living and amenity spaces.

Internal planning of buildings

Using the orientation and internal space planning of buildings to reduce the noise exposure of noise-sensitive rooms, like bedrooms and living rooms.

Using the building envelope to mitigate indoor noise

Using the building envelope to mitigate indoor noise to acceptable levels.

Noise Exposure Zones

By looking at the different zones of exposure from the ranges of events, effective mitigation measures can be assigned to the different character areas of the concept plan.

Zone 1

Zone 1 is closest to Santa Pod Raceway and has the greatest risk of disturbance from event noise. This zone will need to incorporate the highest degree of noise protection within the plot design. Combinations of noise mitigation measures are likely to be required and carefully designed building layouts and façade designs will be considered.

Zone 2

Zone 2 is located further from Santa Pod Raceway and will experience some inherent noise protection from the buildings within Zone 1 and the increased distance. While some of the plots in Zone 2 closest to Santa Pod Raceway will need to incorporate a high degree of noise protection, the majority of this zone can be more flexible with noise mitigation options, incorporating strategies appropriate to the distance from Santa Pod Raceway and existing development screening experienced at each plot.

Zone 3

Zone 3 is the furthest part of the development from Santa Pod Raceway and has the least risk of disturbance from events at the venue. While good acoustic design will still be observed, there will be no requirement for high performance noise mitigation to be incorporated into the design of dwellings within it.

Plan showing location of the acoustic zones

Zone 1

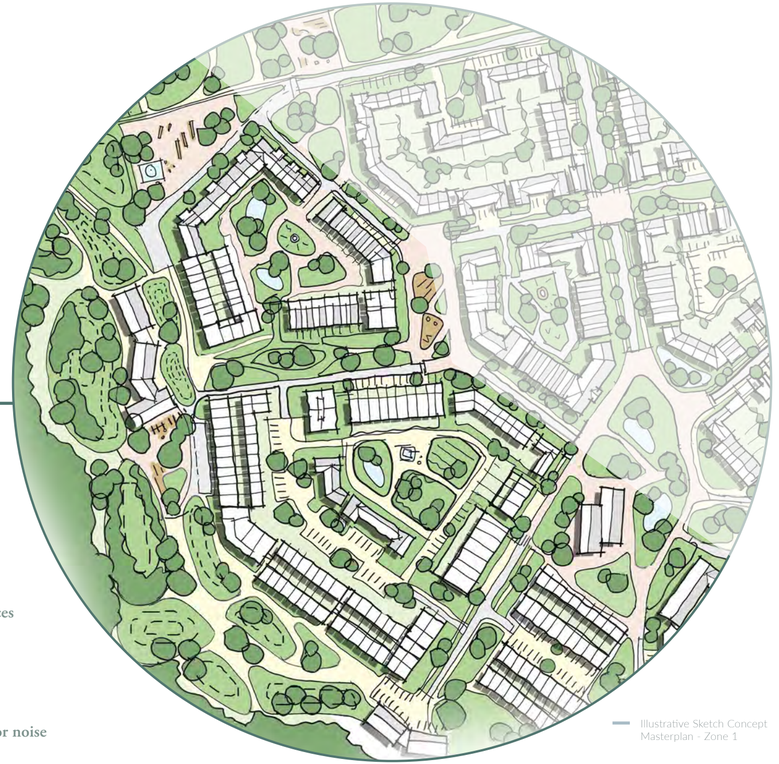
Zone 1 is within 1km proximity to Santa Pod with increased noise levels. Mitigation will be designed to respond to its location.

Zone 1 Masterplan

The sketch is a zoomed in area of the masterplan, illustrating Zone 1. The plan shows how noise mitigation techniques can be underpinned by garden village and good placemaking principles that have been taken forward.

The following acoustic measures have been applied to Zone 1:

- Spatial separation from Santa Pod
- Noise barriers and landscape bunds
- Urban design / building layout
- Protection of outdoor living and amenity spaces
- Internal planning of buildings
- Using the building envelope to mitigate indoor noise



Illustrative Sketch Concept Masterplan - Zone 1

Zone 1 Design Response

Zone 1 incorporates a series of acoustic measures described in further detail on the following pages:

- Spatial separation
- Landscape bunds, walls and noise fences
- Building arrangements
- Building typologies
- Courtyards and outdoor amenity spaces
- Winter gardens
- Residential building ventilation strategy.

Spatial Separation

The Framework Plan has been developed to incorporate a buffer area immediately adjacent to Santa Pod Raceway, between the venue and the development plots.

This buffer area moves the closest proposed residential buildings as far from the source of noise as possible. Presently, the closest proposed residential buildings, directly to the east of Santa Pod Raceway, are at a distance of approximately 650 m, with the majority at least 1 km away.

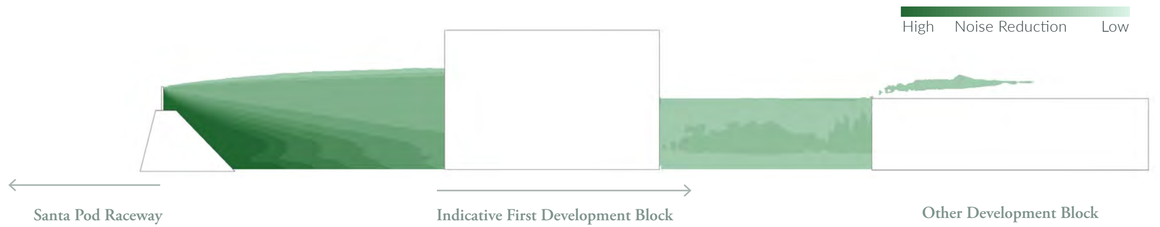
Landscape Bunds, Walls and Noise Fences

A landscaped earth bund will be an effective noise mitigation measure along the perimeter of the site and close to the development plots to screen the dwellings from Santa Pod Raceway. It can be enhanced further by placing a wall or solid and continuous fence along the top.

This combined bund and barrier approach will minimise the footprint of the landscaping feature while providing screening comparable to a much larger feature without the visual intrusion of a tall wall or fence.

Longer, continuous barriers tend to be more effective, so where walls or fences are designed as noise barriers, they will extend as far as possible around the ends of the development. Holes or discontinuities in these wall or fence barriers will significantly reduce the noise reduction ability, so landscape bunds and barriers will be continuous features.

Dense tree planting can be incorporated into the noise bunds on both sides. This planting will present a visual horizon suited to the rural character of the area that changes seasonally. Additionally, this dense planting will have positive benefits in terms of the likely perceived soundscape of the local area. The dense tree line would increase the prevalence of wanted sounds by attracting birds and providing the sound of wind in the leaves.



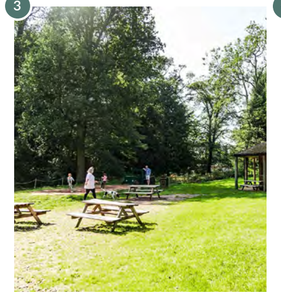
Indicative noise screening in section from landscaping bund with solid fence barrier at the development site perimeter

1. Water features flow between viewing platforms.
2. Example of landscape bund providing terracing for informal seating.
3. Tree planting provides screening and parkland with areas of enclosure for pocket parks.
4. Wetland areas and sculpture trail incorporated within parkland.
5. Meadow planting encourages wildlife habitat and biodiversity.


1


2

Auteil Race Course, Paris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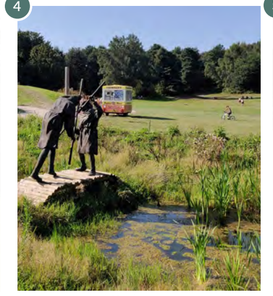
Weston Park Play Area


4

Liverpool festival Gardens


5

Liverpool festival Gardens

Zone 1 Design Response

Building Arrangements

The buildings at the site perimeter facing Santa Pod Raceway will be used as a 'barrier block' to protect the rest of the development. A barrier block is a continuous arrangement of buildings (and walls or fences where necessary) that itself forms a barrier to the noise.

This continuous building frontage with solid walls to maintain continuity or extend the boundary as necessary, will double as an effective method of screening courtyard or external amenity space areas. This 'barrier block' will, as far as possible:

- Run along the edge of the site closest to and parallel to Santa Pod Raceway and wrap around the sides of the plots to protect the rear and side of adjacent buildings.
- Be taller than the buildings being screened behind it.
- Be arranged to minimise noise sensitive residential rooms (e.g. like bedrooms and living areas) facing Santa Pod Raceway. Rooms that are less sensitive to noise (e.g. kitchens, bathrooms, storage rooms, corridors, stairwells) will be placed on the more exposed side of the building.

The development plots in this zone will be carefully arranged to shield other buildings and plots in the development. Care will be taken to ensure that buildings do not reflect sound back towards other buildings or private outdoor amenity spaces. Where this could occur articulated façades and green walls / vegetation will be used to help to diffuse the reflected sound, understanding that it will do little to directly attenuate the noise.

Design Considerations

The images on the following page demonstrate that a continuous built form, situated to the edge of a development or large area of parkland, can be designed sensitively and executed to a high standard to meet with the aspirations of new garden village settlement.

The precedents support the principle of strong building frontage as a key principle within traditional and modern garden villages within the UK. With careful consideration both good design and noise mitigation from the noise source at Santapod can be achieved. The precedent images illustrate that the approach be delivered in both a traditional and contemporary architectural style and is not restricted by character or style.

1. Bournville, Birmingham - Continuous built form and tree planting at edges of green space. Buildings frame acommunal courtyards to the rear.
2. Bourneville, Birmingham - Example of layers of continuous built form, providing protected green amenity to the rear of dwellings.
3. Upton, Northampton - Continuous buildings are located on the edges of the development. Projected gables, articulating the building line and roofscape break up the built form and massing.
4. Newhall, Harlow - A modern interpretation of projected gables and a varied roof line to continuous frontage redevelopment.

1

Bourneville, Birmingham (image courtesy of Google Earth)

2

Bourneville (image courtesy of Google Earth)

3

Upton, Northampton (image courtesy of Googlemaps)

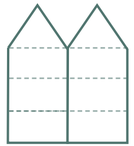
4

Newhall Harlow, Essex, Alison Brookes Architects

Zone 1 Design Response

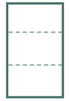
Building Typologies

Residential housing typologies are proposed to allow the relevant acoustic mitigation measures, combined with garden village principles. For this stage of the project the typologies are conceptual, however they help to illustrate the acoustic measures that can be developed further during the detailed design development of the site. A key element of each type is the provision of semi-enclosed external amenity space which can be closed off, and access to additional sheltered external amenity.



1 Apartments - 1 and 2-bed dwelling

- This type is proposed at the most noise-exposed locations. Their form incorporates the following principles.
- Their relative height and arrangement in plan provides an effective barrier to both external amenity and other residential building behind, i.e. they form a 'primary' barrier to areas behind.
- As apartment buildings they could be provided with enclosable winter gardens on the most noise exposed elevations, thereby providing highly protected external amenity for residents, and additional buffering of internal living space - this is in keeping with the historical context of the site, which also consisted of a winter garden.
- Internal layouts will be developed to situate sensitive living spaces on the sheltered side.
- The gaps in between blocks and at the flanking ends of blocks will be closed off with two-storey high walls, providing additional shielding to the shared external amenity immediately behind.



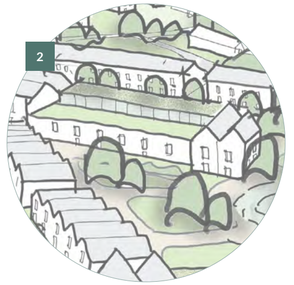
2 Townhouses - 3-bed dwelling

- This type is proposed to be located behind the apartment buildings.
- The front elevation is sheltered behind apartment buildings in the most noise exposed locations. In itself it provides an effective noise barrier to the rear elevation and sheltered external amenity behind.
- The low-level wall includes semi-enclosed external amenity, which is heavily protected when closed off, and significantly shielded even when open.
- The rear block is of lower height, reducing the strength of reflected sound.

Sketch to illustrate the built form and massing of apartments.

Example of 3 storey town house with winter gardens. Flat roofs reduces overall building heights and provides variety to gables. House Types courtesy of FCBS Architects, image produced by Planit-IE.

Example of apartments with gable walls and varied roofscape and steps of building line. Image of Horstead Park, Courtesy of Clague Architects

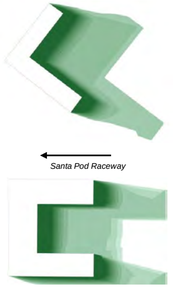


Sketch illustrates a combination of pitched roofs and green flat roofs to create a varied roofscape to frame courtyards.

Zone 1 Design Response

Courtyards and Outdoor Amenity Spaces

Blocks arranged in a 'C', 'U' or 'V' shape will be effectively utilised to create relatively quiet outdoor courtyard or amenity spaces by using the shape of the building footprint to create a barrier to the noise between Santa Pod Raceway and the outdoor amenity space. Where appropriate, additional soundscape features such as water fountains and selective natural planting can also be introduced into these protected spaces to provide both acoustic and psychological sound masking during event days.

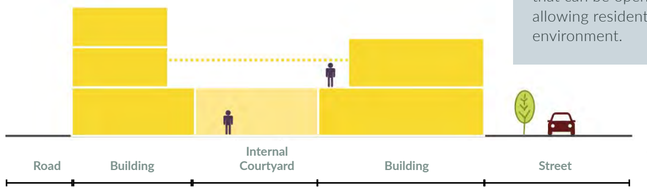


Indicative noise screening in plan within a courtyard space from a 'c' shaped block layout

Courtyard Parking

An approach to car parking has been considered although there is further discussion required regarding parking policy, viability and deliverability.

An approach to car parking is to provide car parking under a raised deck. This would maximise the space within the development, allowing for amenity space to be provided above the car parking. This approach would avoid car dominated streets with cars hidden from the street.



Typical section through Zone 1 to illustrate potential raised amenity above parking

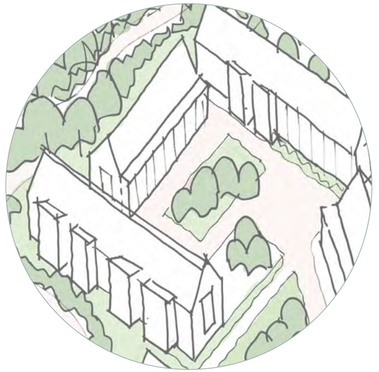
Design Considerations

At Colworth the concept of communal spaces will be demonstrated in Zone 1 due to the location and proximity to the noise source.

Walled gardens are a feature within garden villages and stately residences. The courtyard is a traditional feature within garden villages and is demonstrated in a variety of ways, always with a strong frontage on at least three sides. The courtyard can either be to the rear or to the front of dwellings in a semi-private space.

Continuous boundary walls connect buildings and enclose the amenity space. Courtyard gardens have an inward view for privacy and outward aspects to continue the experience of a walled garden.

Private amenity is provided to each home through winter gardens and internal terraces that can be opened and closed as required, allowing residents to have full control of their environment.



Courtyards are framed by buildings on 3 sides

Corringam Road, Hampstead Garden Suburb

Beverley Fairtrade Town

Port Sunlight, The Wirral

Enderbury Wharf

Zone 1 Design Response

Winter Gardens

Open balconies will not feature in Zone 1, however, providing enclosed balconies or winter gardens is a way to minimise the noise entering the building while still maintaining a connection with the outside. Where enclosed balconies or winter gardens are provided, the ventilation strategy will be considered in detail, as an acoustically attenuated ventilation solution will be required to control internal noise levels.

Traditional example of projected bay windows at Port Sunlight, The Wirral

Modern example of Winter Gardens at Trumpington Meadows, Cambridge

Winter Gardens are not a modern invention, historic buildings pioneered the concept of orientating windows to make the most of the south facing sun with side facets allowing light to penetrate throughout the day.

Residential Building Ventilation Strategy

ProPG indicates that an integrated design approach must be taken to acoustic, ventilation and thermal comfort conditions.

Within Zone 1, where the noise emissions from Santa Pod Raceway events are highest, there is a clear need for a workable holistic sustainable strategy that allows for the ventilation of these dwellings with consideration of noise ingress and the potential impact of overheating.

Core to this strategy is the requirement that people residing within these dwellings shall be able to open and close their windows on event days whilst still maintaining suitable ventilation to their homes.

For the first row of buildings, that have the most exposed façade, the arrangement can be made so that all habitable rooms that require protection, such as living rooms and bedrooms, are located on the screened side of the building. By doing this a high performance passive ventilation supply system is proposed to provide ventilation to this side of the dwelling.

On the façade facing Santa Pod Raceway, the less sensitive kitchen and bathrooms should ideally be located. These spaces have additional ventilation requirements and a multi mode mechanical extract system can be operated. This system could operate intermittently to deal with the additional water vapour from cooking and washing activities, or to provide the necessary extract on event days when it is preferable to close the windows.

Buildings further back from this most exposed row can likely have a more relaxed arrangement as the distance increases from Santa Pod Raceway and the screening provided by the intervening buildings increases.

Risk of Overheating

Most Santa Pod Raceway events happen in the summer period so the risk of overheating occurring when windows are closed should not be overlooked.

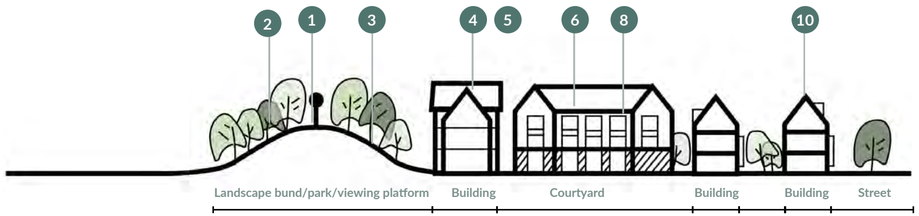
In Zone 1 the majority of buildings are arranged so that the habitable rooms face east. As well as being screened from the noise from Santa Pod Raceway, these rooms can be arranged so that the majority are not facing south. By orientating them in this way they will only be exposed to the sun during the morning period. Additional architectural features can be combined into these windows to provide shade from the sun and so reduce the build up of heat within these rooms.

Illustration of ventilation systems described in Acoustics, Ventilation and Overheating (AVO) Guide, ANC 2020

Zone 1 Design Response

The development plots in this zone will be carefully arranged to shield other buildings and plots in the development. Care will be taken to ensure that buildings do not reflect sound back towards other buildings or private outdoor amenity spaces. Where this could occur articulated façades and green walls / vegetation will be used to help to diffuse the reflected sound, understanding that it will do little to directly attenuate the noise.

1. Raised landscape bunds provide screening from the noise source to development.
2. Trees and landscape provide further screening and a natural parkland with informal footpaths to create areas of enclosure.
3. Wetland areas flow between raised areas of landscape to provide attenuation and an area of wildlife habitat and biodiversity. Raised areas provide viewing platforms and water provides soundscaping.
4. Increased building height to protect development to be higher than the dwellings to the rear.
5. Continuous built form, provides protected green amenity to rear of dwellings.
6. Buildings are designed to wrap courtyards to prevent noise penetration.
7. Internal arrangement and layout of dwellings is designed to create a protective layer in the building. Inhabitable or less-frequently used rooms are situated closest to the noise source i.e. corridors, bathrooms.
8. Winter gardens provide amenity and light to dwellings.
9. Storey heights reduce as buildings move away from noise source.
10. Pitched roofs and gables, steps and staggers in the built form articulates and breaks up the building line.



Illustrative section through zone 1 to show edge treatment

Sketch View of Typical Courtyard Arrangement and Organisation of Buildings within Zone 1

Zone 2

Located slightly further from Santa Pod, the central promenades are protected by development to the western edges. The approach to noise mitigation will be designed to respond with less interventions required.

Zone 2 Masterplan

The sketch is a zoomed in area of the masterplan, illustrating Zone 2. The plan shows how noise mitigation techniques can be underpinned by garden village principles and good placemaking principles.

The following acoustic measures have been applied to Zone 2:

- **Urban design / building layout**
- **Protection of outdoor living and amenity spaces**
- **Internal planning of buildings**
- **Using the building envelope to mitigate indoor noise**

Illustrative Sketch Concept Masterplan - Zone 2

Zone 2 Design Response

Zone 2 incorporates a series of acoustic measures as below, and are described in further detail on the following pages:

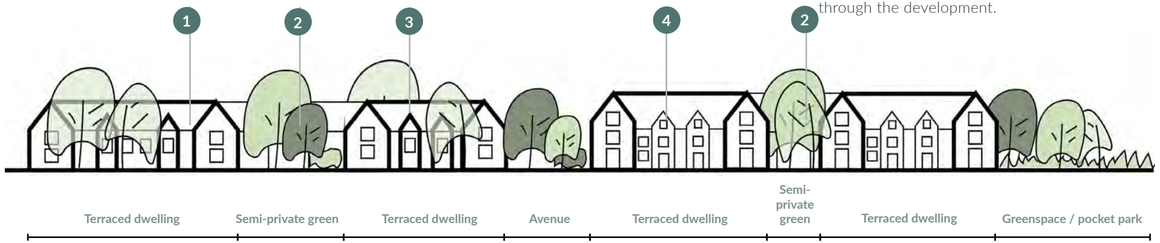
- Building arrangements
- Building typologies
- Courtyards and outdoor amenity spaces
- Balconies and gardens
- Soundscaping and sound masking features
- Residential building ventilation strategy

Building Arrangements

The additional distance from Santa Pod combined with the screening from the buildings Zone 1 means that the majority of remaining buildings and outdoor spaces in Zone 2 will experience less raceway noise. The same care should be taken to control sound reflections and ensure that angled buildings do not reflect sound back towards other buildings on the site.

For this zone, continuous block footprints will be less critical, but staggering the block layouts will help protect areas behind them.

1. Predominantly 2 - 2.5 storeys buildings with occasional 3 storey buildings to address key junctions.
2. Street trees are planted in grass verges to create green avenues that penetrate the development.
3. Terraced units are grouped to have the appearance of a larger building, projected gables provide repetition and rhythm to the elevation.
4. Projections in the facade articulate the built form.
5. Buildings are organised to frame green spaces to create intimate pocket parks and areas for informal play.
6. Layout is arranged to step and stagger, preventing noise from penetrating through the development.



Illustrative section through Zone 2 to show typical building massing and landscape

Illustrative Sketch View of Zone 2 to Illustrate Building Arrangement and Massing

Zone 2 Design Response

Building Typologies

Housing typologies in Zone 2 respond to the noise conditions. This area benefits from the protective layer of buildings in Zone 1, therefore buildings heights can be reduced with opportunities to introduce some detached buildings combined with mews and terraced typologies.

1 Terraced Clusters - 2 and 3-bed dwelling

This typology is designed to be positioned along primary streets and set back from the road.

- There are limited gaps between buildings.
- Walls continue to connect the dwellings and offer sheltered rear gardens that can be either private or shared communal amenity space.
- Gables form a strong form and repetition to complement a tree lined avenue.
- Lower in height, reducing the strength of reflected sound.
- Parking is designed to be on street.

2 Mews Housing - 2-bed dwelling

- The Mews typology is designed to provide continuous enclosure.
- Amenity is provided within the curtilage of the dwelling offering an enclosed private amenity space.
- Dwellings support communal shared gardens to rear.
- Parking is integrated within the dwellings and this provides a further protective barrier within the building.

3 Paired Villas - 3-bed dwelling

The paired villa is proposed to form a transition between Zone 2 and Zone 3 where the development is further away from the noise source.

- There are regular gaps between buildings.
- Provides larger family homes with private rear garden.
- Buildings are set well back from the street behind front gardens defined by hedges.
- Parking is within garages and set back behind the building line, to provide a protective layer to gardens.

1 Terraced Clusters

2 Mews Housing

3 Paired Villas

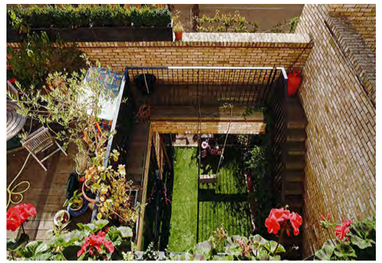
Zone 2 Design Response

Courtyards and Outdoor Amenity Spaces

A similar shape arrangement of 'C' can be applied to the buildings footprints in combination with fence barriers or walls to provide protection to external amenity spaces. Rows of terraces will be used that can be orientated to provide protection to their back gardens.

Additionally, noise screening will make use of

- Existing features, such as a natural slope or an elevated structure.
- Purpose designed features such as a solid boundary fence.
- Purpose designed features of the building, such as a garage or a partially enclosed carport.
- Purpose designed building which acts as a barrier block.



Accordia, Cambridge, FCBS Architects. Example of terraces integrated within the building

Example of green wall

Newhall Harlow, Essex, Alison Brookes Architects

Example of green acoustic barrier

Balconies and Gardens

In a similar design to buildings within Zone 1 the worst effected buildings in this zone can have sleeping areas and other noise sensitive habitable areas located on the side of the building furthest from the source of noise and less noise sensitive rooms positioned on the more exposed side of the building.

Balconies will be possible for some of the blocks further from Santa Pod Raceway that already experience some noise screening from the development. For these areas balconies will be on the side of the building facing away from Santa Pod.

It is expected that for the majority of Zone 2 enclosed balconies and gardens that are protected by the buildings arrangement will provide suitable noise reduction for these private amenity spaces to be used. In some more exposed parts of Zone 2 enclosed balconies may be necessary .

Trumpington Meadows, Cambridge

Horstead Park, Saffron Walden

Derwenthorpe, York

Zone 2 Design Response

Soundscaping and Sound Masking Features

Soundscape features such as water fountains and the sounds created by trees and birds can positively contribute to the local soundscape. These will be introduced where appropriate to provide both partial masking of the noise and to improve the people's perception of the acoustic environment by providing positive sound sources.

Water features can use different designs and materials to optimise sound masking while complimenting the natural feel of the environment.

Tree planting is used throughout Zone 2 which will increase the amount of natural sounds in the environment such as leaves rustling and increasing birdsong.

Building Ventilation Strategy

For the majority of buildings within Zone 2 that experience some local screening from other buildings, a natural ventilation approach could be adopted within a carefully designed façade construction. The natural ventilation system would incorporate an acoustically specified passive ventilation system so that people have the ability to close their windows on event days. Windows of habitable rooms that face south should have consideration given to solar screening in a similar way to that used in Zone 1 to reduce the risk of overheating.

Water features are a key element within the formal landscaped gardens of traditional garden villages, forming a focal point and axis for the heart of the development

Letchworth Garden City

The Gardens At The Royal Hospital Kilmainham, Dublin

Lake Como, Italy

Port Sunlight, The Wirral

Chicago Botanic Garden, Usa

Zone 3

This area is located further from Santa Pod and protected by areas closer to Santa Pod, reduced mitigation measures are required in this location.

The home is carefully woven between the trees, sounds of nature diffuse the noise.

Less constrained by noise, built form gradually starts to soften, and detached dwellings nestle within the trees, more intimate spaces are created with private drives and lanes. Housing typologies are designed to respect the character of the clusters of heritage cottages and farm houses.

Zone 3 Masterplan

The sketch is a zoomed in area of the masterplan, illustrating Zone 3. The plan shows how noise mitigation techniques that can be underpinned by garden village principles and good placemaking principles.

Due to the location of Zone 3, furthest away from the noise source, acoustic mitigation measures are limited, and this has been considered as part of developing the design principles.

The following acoustic measures have been applied to Zone 2:

Urban design / building layout

Illustrative Sketch Concept Masterplan - Zone 3

Zone 3 Design Response

Zone 2 incorporates a series of acoustic measures as below, and are described in further detail on the following pages:

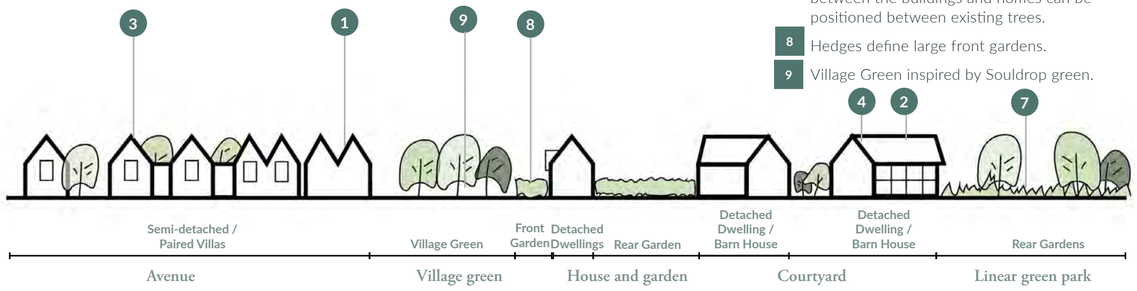
- Building arrangements
- Building typologies
- Courtyards
- Village green

Building Arrangements

The buildings in this zone will be more traditional, detached typologies However, care will still be taken to provide screening to plots further into the development wherever possible by staggering the block layouts to help further protect the areas behind them.

A central green space forms a village green at the centre of this area,, this is inspired by the triangular central space at the village of Souldrop.

1. 2 - 2.5 storeys along primary routes.
2. 1 - 2 storey to courtyard areas.
3. Semi-detached homes provide transition between Zone 2 and 3.
4. Large detached homes are organised around semi-private courtyards.
5. Parking is accessed from either private drives or from courtyards.
6. Architectural language is inspired by surrounding barn typologies and simple in its form.
7. Dwellings are wrapped in landscape and gardens to offer privacy. Landscape penetrates between the buildings and homes can be positioned between existing trees.
8. Hedges define large front gardens.
9. Village Green inspired by Souldrop green.

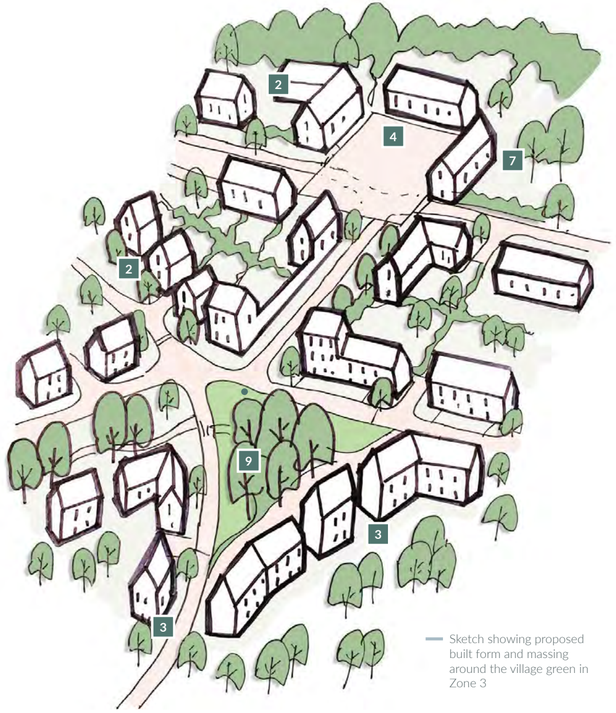


Illustrative section through Zone 3

Barn conversion in Souldrop informs architectural language, interpreted with a contemporary approach to design

Typical housing typology in Souldrop informs rhythm of gables to primary streets

Illustrative sketch to show layout of typical barn typologies arranged to frame courtyard



Sketch showing proposed built form and massing around the village green in Zone 3

Zone 3 Design Response

Building Typologies

Housing typologies in Zone 3 have reduced noise mitigation requirements. There is an opportunity to propose large detached family homes with integrated terraces and private rear gardens. Storey heights and roof pitches are to be lower than the rest of the development.

1 Paired Villas - 3-bed dwelling

- The paired villa is proposed to form a transition between Zone 2 and Zone 3 where the development is further away from the noise source.
- There are regular gaps between buildings.
- Provides larger family homes with private rear garden.
- Buildings are set well back from the street, behind front gardens defined by hedges.
- Parking is within garages and set back behind the building line, to provide a protective layer to gardens.

2 Barn House - 4-bed dwelling

- This typology is designed to be organised around small private courtyards.
- Walls connect the buildings to provide enclosure and intimacy.
- Semi-private courtyard form entrance to private drives.
- L-Shape building form addresses corners and frames spaces.
- Upper floor accommodation is partially within the roof to allow light and space to bedrooms.
- Large rear gardens surround the dwelling.
- Open plan living on ground floor.
- Large detached family accommodation.

3 Garden House - 5-bed dwelling

- Large detached dwelling - 1 - 2 storey
- Positioned within Zone 3 and potential to place in between existing trees.
- Habitable rooms are predominately on the ground floor.
- Opportunity for flexible space to rear for annex or work space.
- Car parking is from private courtyard in garage.
- Flat roof provides opportunity for green roof.
- Private gardens wrap the dwelling on all sides to ensure privacy.
- Light penetrates through glazing in the roof.
- Open plan living to ground floor.

1 Paired Villa

2 Barn House

3 Garden House

Zone 3 Design Response

Courtyards

There are particular examples of agricultural courtyard type developments at Souldrop and Sharnbrook, and whilst the perimeter blocks are much looser in their form, the use of sympathetic brick, stone and timber can help to reinforce a sense of place and character. This has informed the architectural language and arrangement within this area of the masterplan.

Buildings will be organised around private courtyards. Courtyards are framed on at least three sides with continuous walls forming the boundary to the courtyard.

1. Contemporary example of detached house with similar proportions to traditional barn typologies The dwelling is 1.5 storey with habitable rooms in the roof, allowing the dwelling to have reduced visual impact on the setting.
2. Walls enclose intimate courtyard areas for car parking at Souldrop
3. The Avenue at Saffron Waldon is an example of a high quality courtyard with contemporary barn typologies framing the space.
4. A traditional 1.5 storey dwelling in Souldrop provides inspiration for building massing, scale and proportions for residential dwellings

1

Grappenhall Woods

2

Souldrop, Bedfordshire

3

The Avenue, in Saffron Waldon

4

Souldrop, Bedfordshire

National and local examples

Village Green

A new village green is proposed at the centre of this area of the masterplan and inspiration has been taken from the centre of the village in Souldrop. The green at Souldrop is focused around a village green that is also anchored by Knotting and Souldrop Village Hall.

It is a key arrival space in the centre of the settlement and all routes into the village connect to the green.

Buildings are organised to frame the green on all sides and built form is generally continuous frontage with varying roofscape.

There is further opportunity at Colworth to enhance the character of the space with high quality surface materials and incorporating seating to create a functional amenity space.

1

Figure ground of Souldrop village green

2

Souldrop, Image courtesy of googlemaps

3

Souldrop, Image courtesy of googlemaps

4

Souldrop, Image courtesy of googlemaps

Examples of green space at Souldrop

Heritage Asset Design Response

It is considered likely that the change to the setting of previously identified heritage assets, that development of the form proposed within the site would bring, would result in some limited loss of significance, and a low level of 'less than substantial' harm to each asset.

Elsewhere, the site's wooded boundaries on its southern edge screen views into the site from various heritage assets, providing a limit to the views. Provided the well-treed boundaries are retained, the site's development would not result in any notable change to the setting of these assets or adverse impact upon the significance of their significance.

Potential adverse impacts on the nationally listed and locally listed buildings could be limited through sensitive masterplanning.

For the part of the site which lies within the wider, countryside setting of the Grade II* listed Church of All Saints at Souldrop, the proposals provide for belts of trees which extend and complement those already present in the view from the church towards the site. As such, views to the development from the church are filtered by vegetation and, whilst modern residential development is introduced into the most distant field in the view, the countryside character of the church's setting is almost entirely retained. In this respect, the church would still be experienced on the edge of a village overlooking a predominantly rural setting, as it has been historically.

Retention of the boundaries as part of the site's development combined with sensitive masterplanning, would not result in any notable change to the setting of these assets or adverse impact on their significance.

Given the size of the site, there is ample scope to sensitively incorporate the two on-site assets into the development proposals and ensure that the contribution their setting makes to their significance is maintained as far as possible, thus minimising any potential harm. Any residual harm would have to be balanced against the public benefit of the development, as well as the opportunity that sensitive incorporation of these assets into the scheme provides

Figure 7 illustrates how the church's setting can accommodate development without leading to an excessive change in character and a substantive effect on its significance.

Extract of the masterplan illustrates the development proposals to the north, that will be located within the view from the Church of All Saints.

Illustrates the proposed development at Colworth from the view at the Church of All Saints, Souldrop

7.0 Summary and Conclusions

SUMMARY

Summary and Conclusions

This report provides a holistic approach to the sensitive considerations identified at Colworth, i.e. the exposure to noise from events at Santa Pod Raceway. The following factors have been applied to ensure a fully considered and balanced approach to mitigation at Colworth:

- Garden village principles
- Existing rural context
- Good acoustic design.

The development at Colworth is underpinned by good placemaking principles as outlined in National Planing Policy Framework (NPPF) guidance and local planning guidance.

An analysis of garden village principles has also been carried out to ensure the best of garden village principles have been adopted within the Colworth masterplan. The following objectives are implemented at Colworth as shown on the table opposite:

- Holistic understanding of how a place will work.
- High quality design, architecture and public realm creating a sense of pride and a sense of place.
- A green setting, open land, recreation facilities, access to the countryside, excellent landscape and priorities for nature conservation (collectively we now call 'green infrastructure').
- A range of local jobs to create 'community self-sufficiency' and to maximise self containment.
- Excellent education, health and community facilities and convenient local shopping to encourage sustainable living.
- A socially diverse population housed in a range of housing types and tenure.
- In-built ongoing responsibility and management to ensure enduring high standards such as high quality materials and detailing.
- A holistic approach to design due to single land ownership with an emphasis on long term stewardship.

A place first approach has been applied at Colworth to ensure that a vibrant ad sustainable community full of character and richness is at the forefront of the development.

Good acoustic design and good placemaking principles are integrated within the masterplan to inform the mitigation measures that have been proposed and tested. The acoustic mitigation measures have been designed to seamlessly knit together with the design principles. It is important that good acoustic design is incorporated as early as possible and not just included as an after thought or add on feature. Good acoustic design will be part of the overall design approach, to add value to the experience and quality of life for people living at Colworth.

By applying good acoustic design principles to the development at Colworth, it will be possible to achieve acoustic standards suitable for a residential development. These principles achieve significant reductions in noise exposure, far beyond those achieved by other new or existing developments which have not been designed in this way. This report demonstrates that the noise mitigation measures can be implemented in a considered way that allows garden village and good placemaking principles to be adopted.

A framework of design principles ensure that a hierarchy of protected amenity spaces are created throughout the development, which are sensitive to the local townscape and landscape framework of the site and surroundings.

There is a unique opportunity at Colworth to create a garden village for modern living and the masterplanning approach provides the necessary tools to resolve the acoustic environment internally and externally.

Illustrative sketch masterplan

WRENBRIDGE