

Site Analysis

Floyd Zimmerman, FASLA

Sensitive owners and designers understand that from the facility user's perspective, the site and the structures constructed on it are one. Good building design responds to the inherent qualities of the site and at the same time transforms the site into a place that accommodates human enterprise and satisfaction.

Site analysis is a vital step in the design process. It involves the evaluation of an existing or potential site in relation to the development program, environmental impact, impacts on the community and adjacent properties, project budget, and schedule. The site analysis identifies environmental, program, and development constraints and opportunities. A well-executed site analysis forms the essential foundation for a cost-effective, environmentally sensitive, and rational approach to project development.

In recent years parking requirements have become a key issue in site feasibility analysis and the site planning process for many projects in urban and suburban areas throughout the world. Almost every jurisdiction has requirements for parking counts in relation to site density. Many communities have experienced parking capacity problems and are increasing parking requirements in their zoning requirements for new developments. In some areas market forces rather than regulations are driving the increase in demand for parking. A few cities have taken the opposite approach and are deliberately restricting parking in downtown areas to encourage use of mass transit. In these cases, the municipal code may not allow enough parking on a site to meet user requirements. Where larger facilities are being planned in congested urban areas, traffic issues can be even more troublesome than parking issues. Limits on increases in traffic generated by new facilities often restrict size and use more stringently than parking requirements.

Comprehensive environmental assessment of a site has become more important as clients become more environmentally aware and regulatory oversight increases. Clients want to avoid the expense and health risks that accompany environmental contamination on a site, as well as the cost of preventing any adverse impact on community environmental resources that could be caused by their activities. State and local governments, in turn, are becoming more uniform and effective in enforcing environmental controls on development.

Analysis of a building program and the capability of a site to accommodate it, combined with an assessment of political, environmental, and regulatory issues, reveals the development value of a parcel of land.

CLIENT NEEDS

Site analyses vary greatly depending on the owner's situation, the project size, program complexity, and the site. One client may have defined a building program and be in search of a site. Another may have selected a site and be interested in fitting a development program to it. Yet another may have both site and program in hand and be seeking the most efficient, economical, and environmentally sensitive approach to site development.

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Summary

SITE ANALYSIS SERVICES

Why a Client May Need These Services

- ▶ To evaluate development constraints and opportunities for a site
- ▶ To assess one or more sites as a basis for purchase
- ▶ To assess the infrastructure characteristics of a site
- ▶ To gain information as a basis for a zoning variance

Knowledge and Skills Required

- ▶ Knowledge of climate, topography, soils, and natural features
- ▶ Knowledge of site utility distribution systems
- ▶ Ability to evaluate site access and circulation factors
- ▶ Understanding of building siting considerations
- ▶ Familiarity with planning and zoning ordinances
- ▶ Ability to analyze multiple factors objectively
- ▶ Ability to work with related or specialty disciplines

Representative Process Tasks

- ▶ Program investigation
- ▶ Site inventory and analysis
- ▶ Site evaluation
- ▶ Report development

Site selection. Often a client has a development program in mind and is looking for the best site for it. It may be necessary to survey the region, town, or neighborhood for available sites and then to evaluate potential sites in terms of the requirements of the development program. The objective of site analysis during the site selection process is to identify the best site based on the physical, cultural, and regulatory characteristics of the site and its surroundings, as well as the site's adaptability to and compatibility with the proposed program.

Program definition. Here the client may have control of a site and perhaps have a general idea—from experience, intuition, or formal market research—of how to develop it. The focus in site analysis will be on determining the development capacity of the site so the program can be further defined in terms of density, open space, and environmental quality. The resulting site program will set the stage for site design.

Site accommodation. When a client has both a defined program and a selected site, the site analysis objective will be to maximize the potential of the site for its intended use by developing a thorough understanding of the opportunities and limitations it offers.

Development potential evaluation. In some cases a client already owns or is considering the purchase of an undeveloped or underdeveloped property and seeks site analysis to accurately define the general development potential and market value of the property.

Special site studies. Each site will present a unique set of issues and concerns. As part of site analysis, special studies may be required. Examples are utilities studies, environmental impact studies, historic resources inventories, and studies of special opportunities, such as the construction of co-generation plants or solid waste disposal systems.

Many clients require the architect to provide assistance with planning and zoning approvals in conjunction with site analysis services. Increasingly, local authorities are engaging design consultants of their own (sometimes at the owner's expense) to review project proposals. (See Zoning Process Assistance, topic 17.5).

Architects should emphasize the value that quality site analysis services add when they make compensation proposals to clients. Some clients want architects to provide assistance with initial site analysis and/or planning and zoning assistance on a speculative basis. They promise that the architect's costs will be recovered later through compensation for other services if the project goes forward. The architect should emphasize that effective site analysis services can significantly preserve or add to the economic value of a project for the owner and definitely deserve compensation. As noted above, a good site analysis will enable the client to exploit the full development potential of a site. Effective planning and zoning assistance can maximize the potential for regulatory approvals and significantly reduce the owner's risk of economic loss.

Related services include site design, geotechnical services, real estate evaluation, programming, site surveys, market studies, economic evaluations, and land use studies.

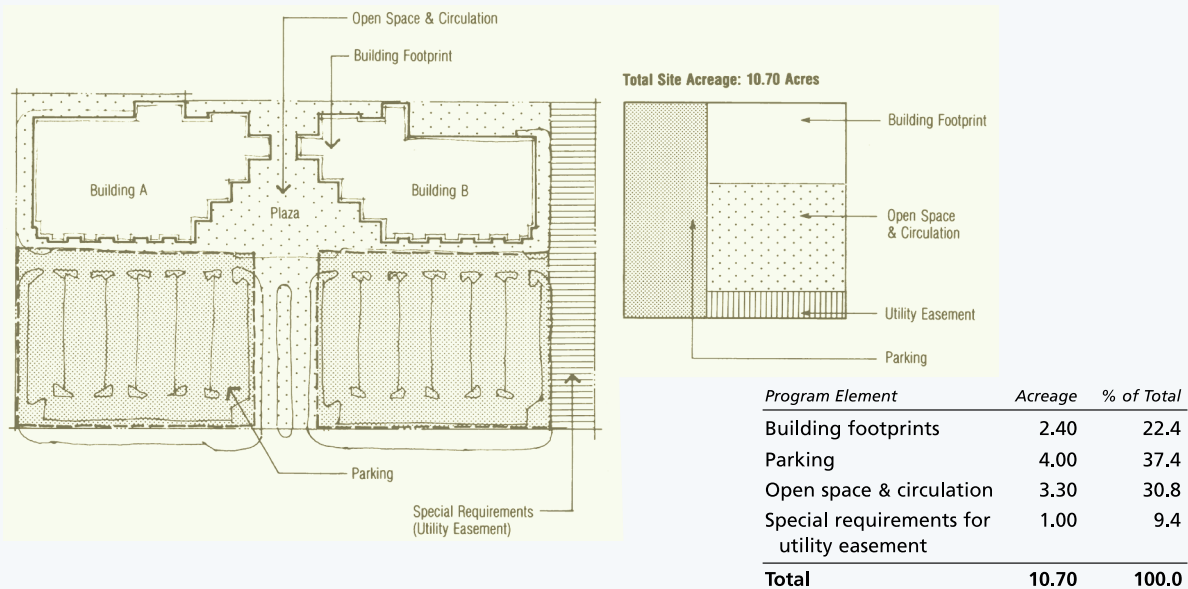
SKILLS

Site analysis services may be performed by an interdisciplinary team or by an individual capable of directing the work of others. For the designer, skill in the initial evaluation of the physical features and quality of a site is fundamental. The designer leading a site analysis effort must be able to evaluate the site in terms of climate, topography, geotechnical and soil characteristics, utilities, natural features and surroundings, transportation and access, and historic preservation and landmarks. Familiarity with planning and zoning requirements such as parking, building density, use, open space, and design controls also is essential.

Accurate assessment of the political climate surrounding new development in a particular neighborhood or community is increasingly important. Good market analysis consultants can provide this assessment along with assistance in evaluating real estate value. Consultants with a planning or real estate background are frequently part of the site analysis team. Other disciplines normally involved include landscape architects and civil, power, and geotechnical engineers.

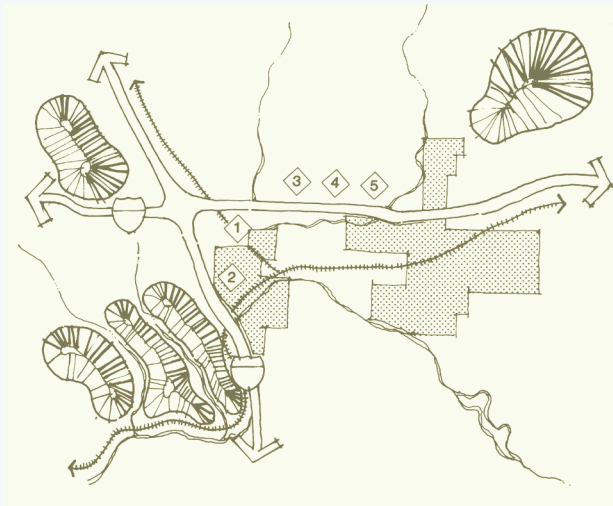
Depending on the project, other specialists may be required. These might include traffic engineers or traffic planners, hydrologists, economic analysts, environmental or wildlife scientists, archaeologists, historians, real estate attorneys, or programming specialists.

Program Elements and Program Evaluation Study



Sample Site Selection Study

This study examines a series of possible sites for a corporation seeking to relocate its headquarters within a few miles of the interchange of two interstate highways.



EVALUATION FACTORS

Excellent (+), Good (□), Poor (-)

Site1 Site2 Site3 Site4 Site5

Traffic factors

Restrictions due to traffic congestion	+	+	+	+	+
Cost of necessary traffic improvements and method of payment	□	+	□	□	□
Mass transit accessibility		+	-	□	□

Geotechnical factors

Foundation conditions	□	□	+	+	+
Earthwork	+	+	-	□	□
Expansion or collapse potential of upper soils	□	+	□	□	□
Seismic shaking	□	□	+	+	+
Faulting	+	□	+	+	+
Seismic liquefaction potential	+	+	+	+	+
Slope stability problems	+	□	□	□	□
Groundwater problems	□	+	□	+	+
Environmental hazards	□	□	□	□	□

Utilities

Availability of water costs for added water capacity	+	+	+	+	+
Availability of sewer costs for added sewer capacity	+	+	□	□	□

Development factors

Height limitations	+	-	+	□	+
Other zoning requirements	+	+	□	+	+
Planning review process	□	+	□	□	□
Neighboring uses	+	□	-	-	-
Available acreage	+	+	+	+	+

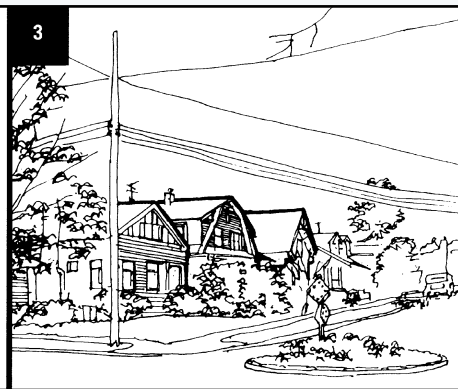
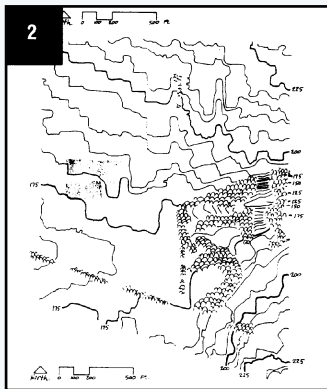
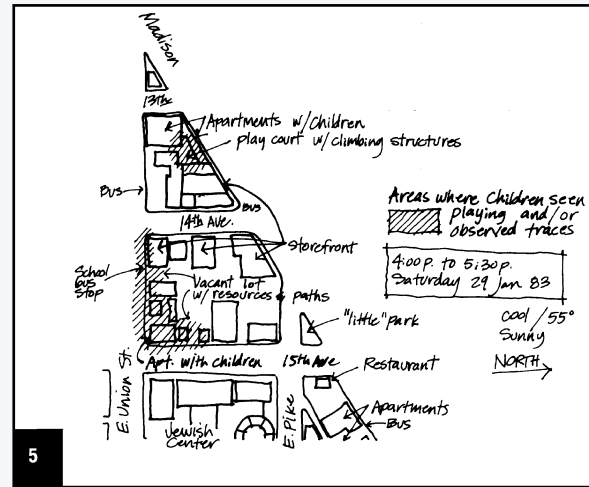
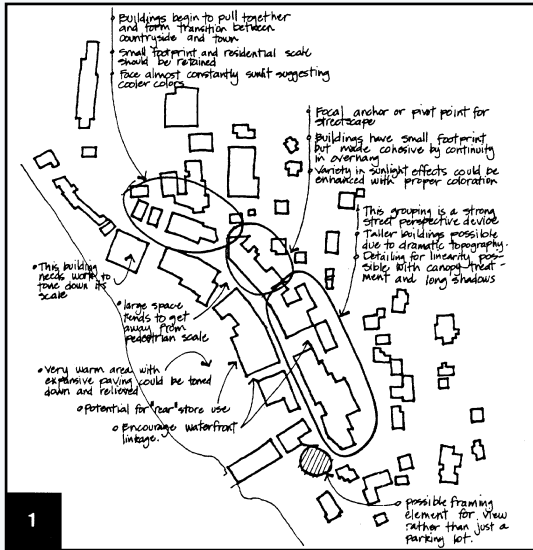
Economic factors

Land price per square foot	□	-	+	-	-
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Sample Context Analysis

Michael D. Knisely, AIA, WBDC Group, Grand Rapids, Michigan
Reprinted from *The IDP*

Here are some of the results from an analysis of a main street in a small city in Washington. Sketches and drawings examine the spatial sequence while passing through the street (1), contextual qualities (2, 3, and 4), and key neighborhood features and activities (5).



PROCESS

The size of the site, its anticipated use, and the programming requirements will have a major effect on the scope of work for site analysis services. The site location, configuration, topography, and access and the complexity of adjacency, utility, and environmental issues related to the site are other key factors. Sites associated with controversial development issues may require more involvement, more related services, and more time.

When assembling the project team, a prime consideration is the level of investigation that each site factor requires in relation to the skills of the project manager. The consultant's familiarity with local conditions should be considered, especially when

working in foreign countries or in areas in the United States with distinctive regional cultures. During site analysis, an architect often explores the potential for a client to become an accepted part of a community. The site analysis team should be fully capable of making a good impression on a community and dealing effectively with its representatives.

Community Development Controls discusses community approaches and regulations for planning, design, and construction.

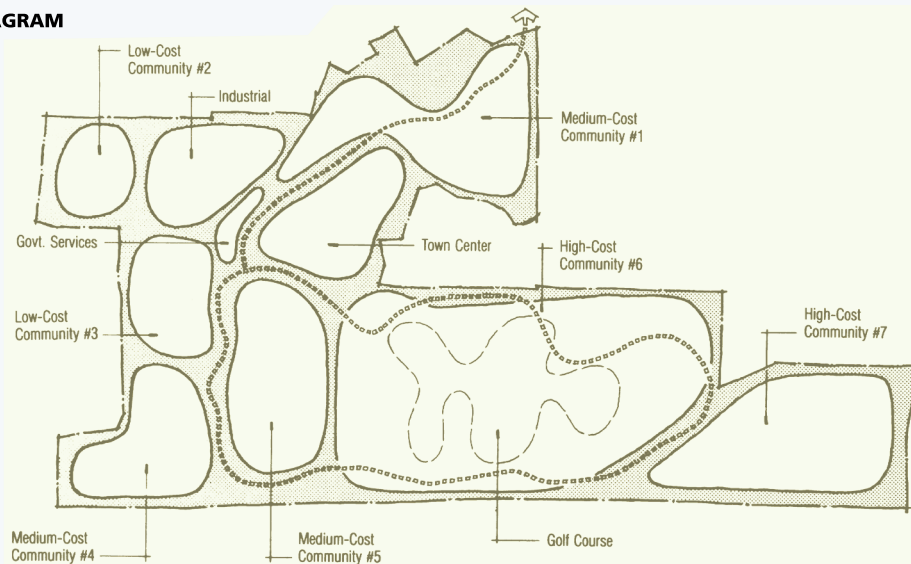
Sample Site Accommodation Study

These are two of many drawings analyzing a large plantation located near a major metropolitan community as the site for a new residential community.

SITE TOPOGRAPHY



LAND-USE DIAGRAM



Generic Steps to Perform the Service

The typical phases in site analysis are program investigation, site investigation and analysis, site evaluation, and report development.

Program investigation. The building program is investigated with respect to the selected or optional building footprints; area required for parking, circulation, open space, and other program elements; and any special constraints or requirements such as security, easements, preserving natural habitat, wetlands, and the like.

Site inventory and analysis. The physical, cultural, and regulatory characteristics of the site are initially explored. The site evaluation checklist identifies factors that may be considered. Some of these factors can be assessed by collecting and analyzing information; others are best addressed by walking the site and traversing its environs. A preliminary assessment of whether a location and site have the potential to accommodate the building program is made. Priority issues—those (such as environmental contamination) that may preempt further investigation—are identified. A site analysis plan is developed. When this has been approved by the client, consultants may be hired to further explore issues that require analysis beyond the capabilities of the core project team.

Site evaluation. At this point, thorough assessments are conducted when necessary to develop the site analysis plan. These may include physical testing of aspects of the site, its improvements, and adjoining properties.

SITE EVALUATION CHECKLIST

Floyd Zimmerman, FASLA, et al.

This is a checklist of the factors that may be involved in evaluating a site. Although lengthy, this list is not all-inclusive; new factors are added from time to time. Information is usually collected only for those items that are pertinent to the project.

PHYSICAL FACTORS

Climate

- A. Prevailing winds
 - 1. Direction
 - 2. Maximum, minimum, and average velocities
 - 3. Special forces (e.g., tornadoes, hurricanes)
- B. Solar orientation
 - 1. Sun angles
 - 2. Days of sunlight
 - 3. Cloud cover
 - 4. Shading of (or from) adjacent structures, natural features, and vegetation
- C. Temperature
 - 1. Ranges of variation
 - 2. Maximums and minimums
- D. Humidity
 - 1. Ranges of variation
 - 2. Maximums and minimums
- E. Precipitation
 - 1. Peak period totals
 - 2. Annual and seasonal totals

Topography

- A. Legal property description including limits of property, easement, rights of way, and north indication
- B. Topographic maps and aerial photos
 - 1. Contours and spot elevations
 - 2. Slopes: percentage, aspect, orientation
 - 3. Escarpments
 - 4. Erosion channels
 - 5. Extent, location, and general configuration of rocks, ledges, outcrops, ridges, drainage lines, and other unique features
 - 6. Visual characteristics
 - 7. Potential problem areas during construction: siltation, erosion, etc.
- C. Analysis of physical features, including major focal and vantage points and their relationships within, into, and out from the site
- D. Existing access and circulation
 - 1. Vehicular
 - 2. Pedestrian
- E. Vegetation
- F. Existing water bodies
 - 1. Location, size, depth, direction of flow
 - 2. Water quality: clean, polluted, anaerobic conditions, etc.
 - 3. Use: seasonal, year-round
 - 4. Wetlands: ecological features
 - 5. Variations: expected water levels, tides, wave action
 - 6. Coastal features

- G. Drainage canals: rivers, streams, marshes, lakes, ponds, etc.
 - 1. Natural and built
 - 2. Alignments and gradients
 - 3. Pattern and direction
- H. Existing waterway easements
 - 1. Surface
 - 2. Subsurface
- I. Surface drainage
 - 1. Patterns on and off the site (location of streams and washes)
 - 2. Proximity to floodplains
 - a. Maximum flood levels
 - b. Frequently flooded areas
 - 3. Local watershed areas, amount of runoff collected, and location of outfalls
 - 4. Swampy and concave areas of land without positive drainage and other obstacles that may interrupt or obstruct natural surface drainage
 - 5. Potential areas for impoundments, detention/retention ponds
- J. Unique site features

Geotechnical/soils

- A. Basic surface soil type: sand, clay, silt, rock, shale, gravel, loam, limestone, etc.
- B. Rock and soil type: character/formation and origin
 - 1. Geologic formation process and parent material
 - 2. Inclination
 - 3. Bearing capacity
- C. Bedrock
 - 1. Depth to bedrock
 - 2. Bedrock classification
- D. Seismic conditions
- E. Environmental hazards

Utilities

- A. Potable water
- B. Electricity
- C. Gas
- D. Telephone
- E. Cable television
- F. Sanitary sewer service
- G. Storm drainage (surface, subsurface)
- H. Fire protection

Immediate Surroundings

- A. Neighborhood structures: buildings, satellite dishes, etc.
- B. Shading and solar access
- C. Noise from streets, emergency services, aircraft, etc.
- D. Odors
- E. Views and vistas

General Services

- A. Fire and police protection
- B. Trash/refuse removal services
- C. Snow removal, including on-site storage

CULTURAL FACTORS**Site History**

- A. Former site uses
 - 1. Hazardous dumping
 - 2. Landfill
 - 3. Old foundations
 - 4. Archaeological grounds
- B. History of existing structures
 - 1. Historic worth
 - 2. Affiliations
 - 3. Outline
 - 4. Location
 - 5. Floor elevations
 - 6. Type
 - 7. Condition
 - 8. Use or service

Land Use, Ownership, and Control

- A. Present zoning of site and adjacent property
- B. Adjacent (surrounding) land uses
 - 1. Present
 - 2. Projected
 - 3. Probable effects on the development of this site
- C. Type of land ownership
- D. Function and pattern of land use: public domain, farm type, grazing, urbanized
 - 1. Present
 - 2. Former
- E. Location, type, and size of pertinent community services
 - 1. Schools and churches
 - 2. Shopping centers
 - 3. Parks
 - 4. Municipal services
 - 5. Recreational facilities
 - 6. Banks
 - 7. Food services
 - 8. Health services
 - 9. Access to highways, public transportation

Economic Value

- A. Political jurisdictions and land costs
- B. Accepted "territories"
- C. Future potential
- D. Size of surrounding lots and approximate price ranges

REGULATORY FACTORS**Zoning Codes**

- A. Permitted uses
 - 1. By variance
 - 2. By special use permits
 - 3. Accessory structures

- B. Minimum site area requirements
- C. Building height limits
- D. Yard (setback) requirements
- E. Lot coverage
 - 1. Floor area ratio (FAR)
 - 2. Percentage of coverage
 - 3. Open space requirements
- F. Off-street parking requirements
- G. Landscaping requirements
- H. Sign requirements

Subdivision, Site Plan Review, and Other Local Requirements

- A. Lot requirements
 - 1. Size
 - 2. Configuration
 - 3. Setbacks and coverage
- B. Street requirements
 - 1. Widths
 - 2. Geometry: grades, curves
 - 3. Curbs and curb cuts
 - 4. Road construction standards
 - 5. Placement of utilities
 - 6. Dead-end streets
 - 7. Intersection geometry
 - 8. Sidewalks
 - 9. Names
- C. Drainage requirements
 - 1. Removal of spring and surface water
 - 2. Stream courses
 - 3. Land subject to flooding
 - 4. Detention/retention ponds
- D. Parks
 - 1. Open space requirements
 - 2. Park and playground requirements
 - 3. Screening from adjacent uses

Environmental Regulations

- A. Water, sewer, recycling, solid waste disposal
- B. Clean air requirements
- C. Soil conservation
- D. Protected areas, wetlands, floodplains, coastal zones, wild and scenic areas
- E. Fish and wildlife protection
- F. Protection of archaeological resources

Other Codes and Requirements

- A. Historic preservation and landmarks
- B. Architectural (design) controls
- C. Special districts
- D. Miscellaneous, e.g., mobile homes, billboards, noise
- E. Site-related items in building codes
 - 1. Building separation
 - 2. Parking and access for persons with disabilities
 - 3. Service and emergency vehicle access and parking

Report development. The site analysis report normally includes property maps, geotechnical maps and findings, site analysis recommendations, and a clear statement of the impact of the findings and recommendations on the proposed building program.

Regulatory approvals normally required during or immediately following the site analysis phase include zoning, environmental impact, and highway/transportation.

“Site Analysis” was originally published in *The Architect’s Handbook of Professional Practice*, 13th edition, ©2000 by the American Institute of Architects, published by John Wiley & Sons, Inc.

The AIA provides a contract document designed especially for these types of architectural services. The AIA suggests a two-part agreement:

B102–2007, Standard Form of Agreement Between Owner and Architect without a Predefined Scope of Architect’s Services provides terms and conditions only.

B203–2007, Standard Form of Architect’s Services: Site Evaluation and Planning provides the architect’s scope of services only.

Together they equal a complete owner-architect agreement.

AIA Document B203TM–2007 is intended for use where the architect provides the owner with services to assist in site selection for a project. Under this scope, the architect’s services may include analysis of the owner’s program and alternative sites, site utilization studies, and other analysis, such as planning and zoning requirements, site context, historic resources, utilities, environmental impact, and parking and circulation. AIA B203–2007 is a scope of services document only and may not be used as a stand-alone owner/architect agreement. NOTE: B203–2007 replaces AIA Document B203TM–2005 (expired May 31, 2009).

For more information about AIA Contract Documents, visit www.aia.org/contractdocs/about

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