Air Force Center for Engineering & the Environment

Tama Hills Golf Courses
Environmental Management (GEM) Plan
Yokota AB, Japan

November 2009

San Antonio, Texas

Yokota Air Base Golf Courses Environmental Management Policy

In concert with the
Yokota AB mission,
we pledge to employ
only those management practices
that minimize or eliminate the potential
for negative impacts to the environment
and the surrounding community,
ensure compliance with all
appropriate regulations,
and to regularly reevaluate our processes
to achieve the highest standards
of environmental excellence.

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Executive Summary

U. S. Air Force GEM Program

The U. S. Air Force Golf Course Environmental Management (GEM) program is a proactive Air Force Center for Engineering & the Environment (AFCEE) initiative to foster a better understanding of the environmental challenges facing our golf courses worldwide.

Armed with the support and approval of the Air Force Services Agency golf program, AFCEE's goal is to facilitate the creation of an environmentally friendly golf course facility while supporting the installation mission. Chapter 11 of AFI 32-7064 requires a GEM Plan as part of the Integrated Natural Resources Management Plan (INRMP).

GEM Program process

There are five steps in the GEM program process:

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision

Environmental Compatibility Quotient (ECQ) scores

The following is the summary of the environmental compatibility quotient (ECQ) scores for the site visit conducted in Month Year:

- **Actual ECQ = 64, Getting started**
- **Potential ECQ = 83, Showing progress**

Environmental challenges

The following environmental challenges were identified in compiling this Final GEM Plan:

- Wetlands
- Invasive species
- Threatened or endangered species
- Water quality
- Historical/cultural
- Erosion
- Airfield safety criteria

Where do we go from here?

The true measure of a successful GEM program is how well is it executed in the field each and every day. The installation golf and environmental staffs should continue to analyze, document, monitor, evaluate, revise, and implement changes based on lessons learned. The GEM Plan should be updated annually and revised during the next INRMP iteration update. The entire GEM process can be found on the regularly improved AFCEE GEM program website (http://www.afcee.brooks.af.mil/ec/golf/).

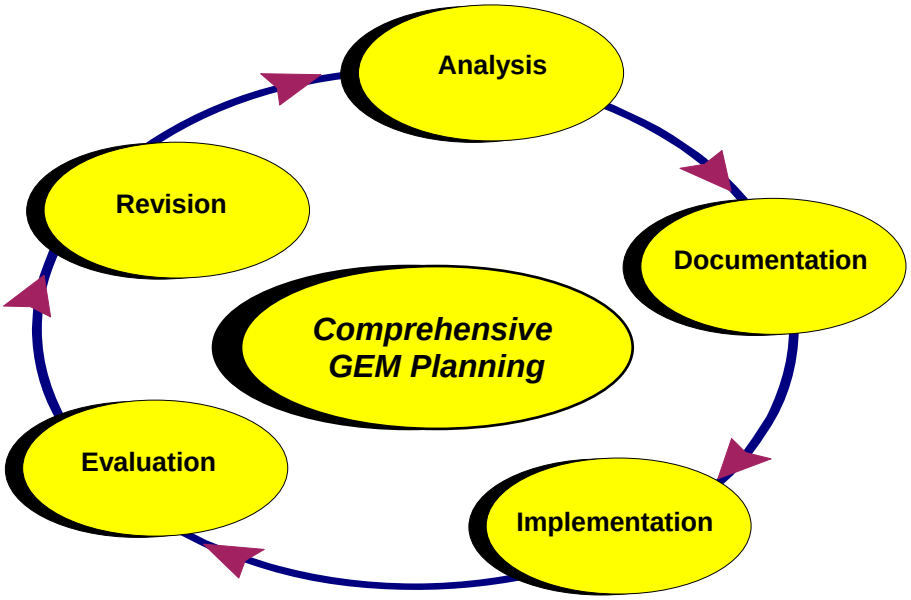
Yokota AB
Golf Courses
Yokota AB, Japan

The golf course is only one of many recreation opportunities at Tama Hills.

The golf course environmental baseline assessment (GCEBA), or the Draft Golf course Environmental Management (GEM) Plan is the initial step in creating a successful ecosystem-based comprehensive GEM Plan. The intent of the GEM Plan is to provide an efficient management tool that will enable course managers to devote more of their efforts to caring for their customers and the golf course. Properly designed and implemented, the GEM Plan will keep the entire golf facility in compliance with the constantly changing environmental requirements while contributing to the local community.

The GEM Initiative

The goal of the GEM initiative is to facilitate the creation of an environmentally friendly approach to golf course management while protecting and promoting the great game of golf. AFCEE is dedicated to helping to identify ways that more rounds can be played on better-conditioned courses while minimizing or eliminating negative impacts to the environment. In most cases, golf courses are being managed compatibly with the environment. The comprehensive GEM planning process is the vehicle to document our successes while communicating directly with our customers, commanders, and local community.



GEM Process

The five steps of the GEM Process are based on continual improvement.

GEM Process

Efficient implementation is the most important aspect of any initiative where practices and procedures are examined and may undergo significant change. This is especially true of the comprehensive GEM planning process. The GEM Plan is derived from several diverse environmental regimes to include the National Environmental Policy Act and the ISO 14001 environmental management system.

There are five basic steps in the implementation of the GEM Planning process:

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision

Analysis

Experienced environmental managers realize the importance of assembling all of the data relevant to a problem prior to determining its best solution. Comprehensive analysis is the most important task of the GEM process. Properly completing the analysis is paramount to the long-term compatibility of a golf course's management practices with the local community's natural resource and environmental management goals and objectives.

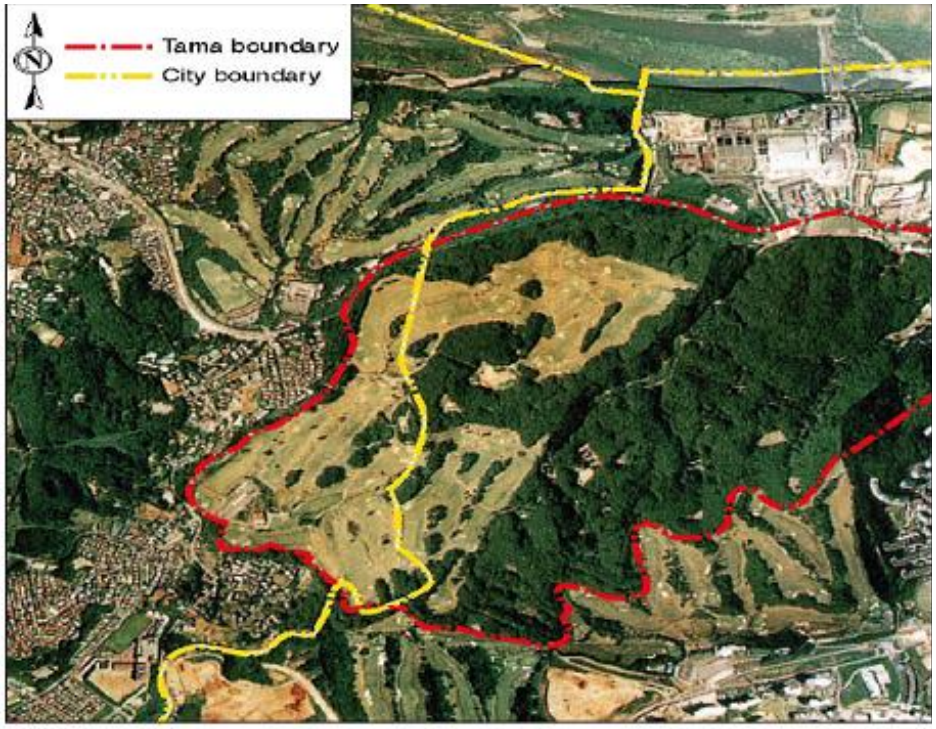
GCEBA (DRAFT GEM PLAN) COMPONENTS

The GCEBA is comprised of the following components:

- Site visit, interviews, and data collection
- Course specific analysis
- Miscellaneous facility review
- Environmental compatibility quotient checklists
- Identification of potential environmental management challenges
- Summary report

Documentation

It is not enough just to know how to create a successful golf course environmental management program. There must be a written record documenting existing site data, maintenance practices, pesticide applications, and other historical golf course activities. By documenting what we know, we will be able to determine how to make better decisions in the future. The completed GEM Plan will assist in the daily management of the course while providing a convenient vehicle to communicate to the community and customers alike the environmental issues that challenge golf course managers as well as their plans to deal with them. In order to reach established environmental stewardship goals the golf course staff must consistently employ only those management practices that minimize or eliminate potential negative impacts to the environment.



The Tama Hills Service Annex.

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Golf Courses
Yokota AB, Japan

U.S. AIR FORCE GEM PLAN COMPONENTS

The GEM Plan will be comprised of the following components:

- GCEBA report
- Map of the entire golf course facility grounds depicting locations of the significant environmental management challenges and the golf course facilities
- Booklet that describes the environmental management challenges depicted on the GEM Plan map
- Specific practices that will be employed by the golf course staff to deal with each environmental management challenge after coordination with and approval by the installation environmental staff
- Compilation of best management practices employed at the golf course in their implementation of the GEM initiative recommendations

Implementation

Positive and decisive action is the only true measure of the success of the GEM Plan. By implementing new practices, whether to knowingly improve the course's role in the environmental stewardship of the installation or to just try new ideas to determine their value, will the golf staff and golfers benefit. The installation golf staff should consider adopting the GEM Initiative process and establish an environmental policy that minimizes or eliminates any and all potential negative environmental impacts.

Evaluation

In order to ensure the highest quality of customer service and environmental stewardship, there must be continual self-evaluation and improvement. There also should be consistent, on-going measurement of the reduction or elimination of environmental impacts the newly implemented practices have on the course. For example, documenting the reduced use of inputs such as fertilizers, pesticides, and irrigation can be used to demonstrate the increased environmental stewardship of the golf course management practices as well as the overall value of the GEM initiative. It is important for golf courses to show improvement over time. Improvements can be easily accomplished by regularly evaluating golf course maintenance methods, practices, and management approaches to day-to-day issues in concert with the desire and ability to change.

Revision

The very nature of a superior GEM Plan implies that all documents be regularly maintained to represent the most current conditions. Golf course managers and superintendents should be constantly looking for ways to improve their environmental stewardship. Acting on lessons learned is right behind initial implementation as the most important aspect of a successful GEM Plan. The GEM Plan should be kept as current as possible at all times. Ideally, it should be updated annually and completely rewritten on the same cycle as the Integrated Natural Resources Management Plan.

Course Specific Analysis

One of the most pragmatic and enjoyable tasks in the baseline assessment portion of the GEM process is the course specific analysis. From a general description of the course to the details of the course's history and makeup to the various observations on course playability, aesthetics, and style of management, the course specific analysis sets the stage for the rest of the GEM Plan report.

Tama Hills Golf Course description

Yokota Air Base is the proud steward of two golf facilities, a nine-hole short course replete with driving range on the main base and a full-scale, top-of-the-line eighteen-hole course at the Tama Service Annex (Tama SA). Tama SA lies in the Tama Hills area, approximately 10.2 miles (16.5 km) southeast of Yokota Air Base, approximately 15.5 miles (24.9 km) due west of Tokyo, and within the municipalities of Tama and Inagi, both part of the Tokyo Metropolitan Government.

TheTama Hills Golf Course is one of the Air Force's finest golf facilities. Eighteen championship-quality holes with two greens each routed through a tumbling landscape full of mature vegetation best describes the star of the Tama SA recreation area. The course's finest attribute is its marked improvement since the arrival of current management both in the clubhouse and the maintenance facility. Dense turf, well-defined fairways and smooth greens greet the customers of Tama Hills. A lot of customers, too it seems, as Tama Hills may be the most played course in the Air Force in 2009.

Tama Hills Golf Course, Yokota AB, Japan

Par 3 Course description

The Par 3 course measures under 1000 yards and is great facility to practice one's short game. Tiny greens, limited space and proximity to the airfield are the only restrictions to the facility's contribution to the Airmen at Yokota AB. A fine and extremely experienced and loyal staff round out the amenities at Yokota's Par 3 course.

Par 3 Course Layout

Yokota AB
Golf Courses
Yokota AB, Japan

Par 3 Golf Course, Yokota AB, Japan

General details

Climate	Temperate with coastal influence
Average annual precipitation	56.6 inches
Average growing season	April - November
Elevation	≈300’ ASL
Prevailing wind direction	Northwest/southeast

Tama Hills Golf Course details

Architect		Unknown/Government of Japan
Year constructed		1969
Total facility acreage		259 acres
Total actively maintained acreage		134 acres
Par		36-36-72
Yardage/Rating/Slope		Blue- 6963/72.8/120
		White- 6334/69.7/118
		Silver- 5772/67.4/111
		Red- 5382/71.7/122
Turfgrass	Tees-	419 Hybrid Bermuda / Ryegrass
	Fairways-	Kourai zoysia
	Greens	Kourai zoysia
	Roughs-	Zoysia japonica
Irrigation source		Non-potable groundwater (well)

Par 3 Golf Course details

Architect	Unknown/civil engineering
Year constructed	1976
Total facility acreage	17acres
Total actively maintained acreage	17 acres
Par	27 (9 holes)
Yardage	811 yards
Turfgrass	Kourai (Himei zoysia)
Irrigation source	Potable

Environmental Compatibility Quotient (ECQ) Checklists

Many diverse and complex aspects of golf course management have been revealed through the literature search conducted to compile this study. In order to simplify the process, these aspects have been summarized into eight main topics and incorporated into five distinct environmental compatibility categories.

- Planning & Compliance
- Operations & Maintenance
- Water Resource Management
- Conservation
- Pesticides & Pollution Prevention

The environmental compatibility quotient (ECQ) checklist questions have been compiled using examples from several sources including Audubon International, Center for Resource Management, and Committed to Green. The ECQ checklists represent the best method currently available to determine the relative environmental compatibility of a golf course's management practices. The checklists can be used in many ways including:

- As a tool to establish a current snapshot or baseline of a golf course's relative environmental compatibility
- As a tool to identify areas for improvement or to demonstrate current successes
- As a self-assessment tool for the golf course manager and superintendent
- As documentation for an environmental award nomination
- As documentation for regulatory requirements or inquiries from customers, the media, or the general public

Determining the Environmental Compatibility Quotient (ECQ)

The ECQ compiled for an installation's course is a snapshot of the overall performance and compliance with the GEM Plan. There are two measures obtained as a result of using the ECQ checklists to determine the status or quality of the environmental management program: 1) determining the actual and; 2) potential environmental compatibility quotients.

- Actual ECQ- the total percentage of "Yes" responses for all ten checklists. This number represents the current level of the golf course management practice compatibility with the environment
- Potential ECQ- the total percentage of "Yes" responses plus the total percentage of "Partial" responses for all ten checklists. Maybe the most significant measure; the potential ECQ represents a level of compatibility that could be reached by fully implementing a particular practice or procedure.

CHECKLIST RESPONSE KEY

- **Yes** = Practice is complete or ongoing and verifiable (✓* = Not applicable)
- **Partial** = Practice has been initiated but is incomplete
- **No** = Practice is not in place

The following ECQ checklists are a record of the interview conducted with Tama Hills Golf Courses manager and superintendent during the visit to Yokota AB.

Planning & Compliance

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Has management demonstrated that environmental stewardship is an important part of their responsibilities by initiating the Comprehensive Golf course Environmental Management (GEM) Planning process?	✓		
2	Is the GEM Plan complete, updated regularly, and readily available to employees and customers?		✓	
3	Has the golf course adopted and posted an environmental policy?		✓	
4	Is a map of the property highlighting environmental challenges posted for employees and customers?		✓	
5	Does management conduct a comprehensive annual evaluation for each identified environmental challenge and its management approach, objective, and target?		✓	
6	Does the course have a Tree Management Plan complete with planting plan and maintenance schedule?		✓	
7	Is there a readily-available and regularly updated Integrated Pest Management Plan specifically written for the entire golf course property?	✓		
8	Is there a map of the course's "hot spots" or specific areas that may require regular special care or attention?		✓	
9	Is there an up-to-date comprehensive golf course development plan or master plan that details the desired short- and long-term improvements to the facility?		✓	
10	Is there at least one project planned and funded for the next year that would increase the compatibility of the course's management program with comprehensive GEM planning goals and objectives?	✓		

Planning & Compliance Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Have all employees been familiarized with the GEM Plan and are they trained regularly on the importance of environmental performance and compliance with its goals and objectives?	✓		
12	Are environmental management issues regularly discussed during staff meetings?	✓		
13	Are the actual amounts of each pesticide or fertilizer on the facility available in writing for every application over the last year?	✓		
14	Has the facility attained full certification in the Audubon Cooperative Sanctuary Program or similar industry-recognized environmental management program?			✓
15	Are employees trained in their native language on the benefits of minimizing potential negative impacts?	✓		
16	Are environmental targets being met based on an annual review or as needed basis?		✓	
17	Are there documented functional or aesthetic thresholds integrated into pest control decisions?	✓		
18	Is there a written comprehensive Golf Course Water Resources Management Plan that delineates the care of each of the course's water features?			✓
19	Are employees trained on what to do in case of a spill and have spill containment kits been provided at all appropriate locations?	✓		
20	Have all maintenance procedures been examined to determine their potential to negatively impact an identified environmental challenge?	✓		
	Totals	**10**	**8**	**2**

Operations & Maintenance

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is there a written, regularly updated and comprehensive Turfgrass Management Plan for each type of turf and playing area?	✓		
2	Are there designated natural or minimally-maintained buffers around sensitive landforms and/or core wildlife habitats?	✓		
3	Are green, tee, and fairway mowing heights maintained at levels that do not excessively stress important playing surfaces?	✓		
4	Are aeration, topdressing and other drainage improvements regularly implemented to improve soil health and minimize or eliminate inputs of pesticides or fertilizers?	✓		
5	Are soil tests or plant tissue analysis regularly used to determine turfgrass nutritional requirements?	✓		
6	Is the information collected in soil tests and plant tissue analysis integrated into a regularly updated Nutrient Requirement Plan and map?	✓		
7	Is there at least one project planned and funded for the next year that would improve the course's protection of the environment?	✓		
8	Are all appropriate employees trained to be familiar with (national, federal and state) regulations that apply to storage and handling of potentially hazardous materials used on the property?	✓		
9	Have all aspects of the golf course property other than the course been examined for potential negative environmental impacts?	✓		
10	Have all employees received documented training that would increase their awareness of the GEM program environmental stewardship goals and objectives?		✓	

Operations & Maintenance Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are containers used to store used oil for equipment maintenance in good condition, not leaking, and clearly labeled?	✓		
12	Are oil/water separators and/or golf course wash racks operating properly and correctly maintained?		✓	
13	Are all golf course vehicles and equipment maintained and cleaned in a manner that helps to eliminate the potential for spreading of disease or other contamination?	✓		
14	Are electric motor-powered equipment or vehicles being utilized where appropriate?			✓
15	Are waste products such as oil, grease, tires, and batteries stored in a covered container and disposed of properly off site?	✓		
16	Does the superintendent use hand held GPS units to assist in GIS mapping of the golf course areas?			✓
17	Are energy efficiency ratings factored into equipment purchases for use throughout the facility?		✓	
18	Has the entire facility been studied to quantify solid waste streams to identify functions that produce the greatest quantities?	✓		
19	Are at least 90% plates, cups, and utensils in use by the restaurant/snack bar facility reusable rather than disposable?	✓		
20	Does course management utilize a web-based golf course planning tool for every day decision-making and recordkeeping?			✓
	Totals	**14**	**3**	**3**

Water Resource Management

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are written records of water quality monitoring activities, results, and pollution control measures readily available and used to establish appropriate maintenance practices?	✓		
2	Where appropriate, are slow-release fertilizers and/or spoon-feeding techniques used to reduce the potential for runoff impacts and nutrient loading to water quality?	✓		
3	Does the irrigation system operate using computerized controllers based on real-time evapotranspiration rates?			✓
4	Are the golf course sprinklers and outdoor irrigation of non-golf course areas and indoor plumbing regularly monitored and maintained for proper distribution and leaks?	✓		
5	Have low-flow water saving devices been installed wherever possible?			✓
6	Are triploid, non-reproducing grass carp or similar fish species used to control unwanted aquatic vegetation in major water features?	✓*		
7	Is there at least one project planned and funded that would minimize or eliminate a potential water quality or erosion problem?	✓		
8	Are water features regularly monitored for algae, erosion, excessive aquatic plant growth, etc.?	✓		
9	Are low impact design (LID) principles such as using vegetative or drainage filters to cleanse parking lot runoff prior to leaving the property?			✓
10	Are there signs appropriately located to warn golfers of the potential hazard of drinking recycled or otherwise non-potable water?	✓		

Water Resource Management Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are properly functioning flow meters employed to monitor total potable and non-potable water use?	✓		
12	Has the irrigation system or its components recently been upgraded to reduce or eliminate inefficiency and overall water use?	✓		
13	Is there a map of the watershed in which the golf course property resides and location(s) of floodplains and storm water drainage that exists on the property?	✓		
14	Is the quality of the irrigation water regularly checked to determine overall quality or nutrient, salt or total suspended solid parameters?	✓		
15	Is water quality data regularly collected to establish baseline conditions and maintenance procedures for all water features on the property?			✓
16	Is at least 75% of the water used for irrigating the golf course property from recycled or other non-potable sources?	✓		
17	Is there at least one project planned and funded that increase the course's water use efficiency?		✓	
18	Have the property's Water Quality Management Zones been identified and mapped based on industry-standard risk factors?			✓
19	Has the property's water features been studied to determine the aquatic and amphibious species population?	✓		
20	Has the property been examined for potentially significant wetlands or associated sensitive water-based habitats?	✓		
	Totals	**14**	**1**	**5**

Conservation

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is all motorized equipment maintained for efficient operation that would minimize the potential of creating excessive air polluting emissions?	✓		
2	Has the entire golf course property been examined for critical habitats, species of concern and threatened or endangered species?	✓		
3	Are all manmade ponds or other large water features adequately lined to minimize or eliminate losses?			✓
4	Are employees encouraged to minimize their trips around the course to conserve on the use of fossil fuels?			✓
5	Have efforts been made to physically connect natural areas to facilitate wildlife movement through the course property?	✓		
6	Have all necessary permits been secured and are they updated and their requirements satisfied in a timely manner?	✓*		
7	Are recycling containers conveniently provided for customer and employee use throughout the golf course facility?	✓		
8	Has there been a study to determine the presence of invasive species on or near the course?	✓		
9	Is there a comprehensive and readily available Drought Management Plan for the entire golf course facility?			✓
10	Has there been a demonstrated 2% annual reduction in potable water use since FY07?			✓

Conservation Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Has there been a demonstrated 2% annual reduction in irrigation water use starting in FY10?	✓		
12	Are at least 85% of plants used in landscaped areas drought-tolerant native trees, shrubs, groundcovers, or their cultivars?	✓		
13	Are there signs posted to highlight key habitats or have appropriate areas been designated "Environmentally Sensitive Zones" per The Rules of Golf?	✓		
14	Has a comprehensive energy audit been conducted for the entire golf course facility?			✓
15	Has the use of petroleum products been tracked and has there been a demonstrated 2% reduction each year since FY05?		✓	
16	Is there an inventory of bird and mammal species documented, maintained and readily available?	✓		
17	Is there a comprehensive Energy Management Plan compiled for the entire golf course facility demonstrating a 3% annual reduction since FY03?			✓
18	Have all damaged or degraded habitats due to construction or maintenance of the course been fully restored or improved?	✓		
19	Has the entire property been examined for archaeological, cultural or historical resources?	✓		
20	Is the irrigation pump station an energy efficient, variable frequency drive?			✓
	Totals	**12**	**1**	**7**

Pesticides & Pollution Prevention

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are there established, documented and communicated minimally-maintained and fertilizer and pesticide application buffer areas around water features or sensitive landscapes?	✓		
2	Is the equipment wash rack adequately covered to minimize or eliminate collection of precipitation?			✓
3	Does the chemical storage area have a sealed metal or concrete floor and are all pesticides handled over an impermeable surface?	✓		
4	Does the chemical storage area have a lip along the edges and does it have at least 150% of total storage volume secondary containment?	✓		
5	Are liquid products stored below dry products and are dry materials stored on pallets or shelves to keep them off the floor?	✓		
6	Has the least toxic pest control strategy been identified for each of the most common pests and is it always used first when an action threshold is reached?		✓	
7	Is equipment cleaned with compressed air or blowers on part of the course instead of, or prior to washing at a designated wash rack?	✓		
8	Are leachate potentials of pesticides considered in the integrated pest management process?	✓		
9	Does the fuel storage/delivery area comply with local, state, federal, or other applicable regulations?	✓		
10	Are written records maintained of all applications of pesticides to include: - the pest and treatment type (preventative/curative); - the location (specific area) of each pesticide used; - the area (SF/SM) & quantity of each pesticide used; - the chemical & common name of active ingredient(s); - the date, location, or purpose of the application?	✓		

Pesticides & Pollution Prevention Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are all pesticide applications recorded and mapped to guide future pest control decisions?		✓	
12	Other than the superintendent, are there trained scouts on staff to monitor turf and plant health and pest problems?	✓		
13	Are there scouting forms utilized and are they collected and organized into a report or guide for use in future pest control decisions?			✓
14	Is there an established aesthetic or functional threshold for each of the course's most common pests that may help reduce pesticide and fertilizer inputs?	✓		
15	Are current copies of all Material Safety Data Sheets (MSDS) for all chemicals used anywhere on the golf course property maintained and readily available?	✓		
16	Are fertilizers and pesticides stored in separate facilities?		✓	
17	Is the chemical storage structure/area locked, well-ventilated and fire-resistant and is access limited to appropriate personnel?	✓		
18	Are all fertilizer applications made by a certified fertilizer applicator and are they recorded and mapped to guide future actions?		✓	
19	Are golfers adequately notified in the pro shop and on the first and tenth tees about the day's planned or recently completed spraying of any chemical or fertilizer?	✓		
20	Are there written pest profiles for common regional pests along with alternative potential control measures readily available?	✓		
	Totals	**14**	**4**	**2**

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Golf Courses
Yokota AB, Japan

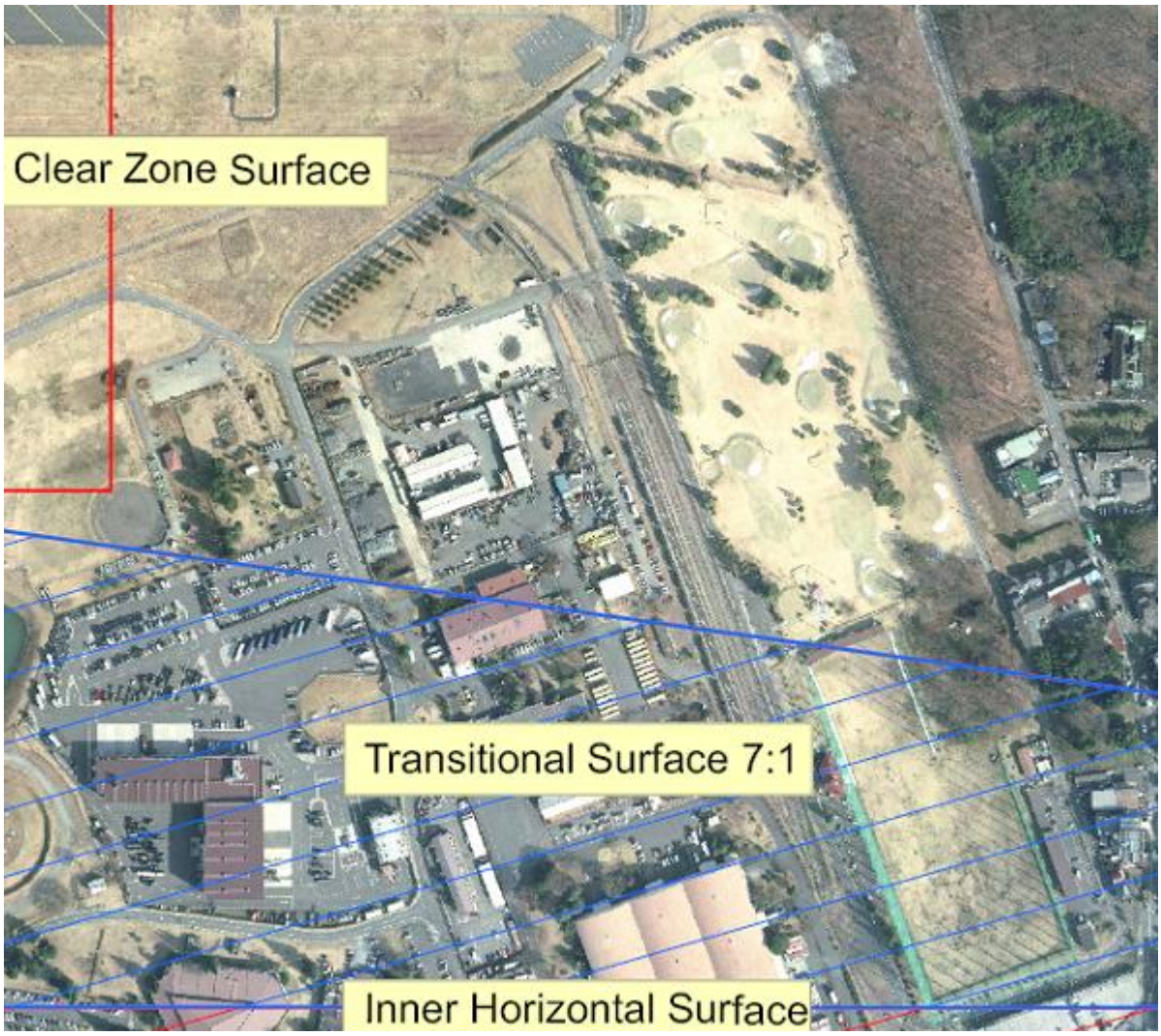
The short, uphill par 4, 17th hole is one of the easier driving tests at Tama Hills.

Yokota AB Golf Courses – Nov 09 Environmental Compatibility Quotient Summary			
Environmental Compatibility Category	**Yes**	**Partial**	**No**
Planning & Compliance	**10**	**8**	**2**
Operations & Maintenance	**14**	**3**	**3**
Water Resource Management	**12**	**1**	**7**
Conservation	**14**	**1**	**5**
Pesticides & Pollution Prevention	**14**	**4**	**2**
Totals	**64**	**17**	**19**

- **Actual ECQ = 64, Just started (Red)**
- **Potential ECQ = 83, Showing progress (Yellow)**

Environmental Compatibility Quotient Scoring Scale	
Total Yes or Partial Responses	**Environmental Compatibility Level**
90-100%	**Advanced (Green)**
70-89%	**Showing progress (Yellow)**
69% or less	**Just started (Red)**

Tama Hills Golf Course Environmental Challenges Map



Par 3 Golf Course Environmental Challenges Map

Environmental Challenges

One of the important results of the GEM process is the identification of significant environmental challenges to be addressed in the GEM Plan. Along with the newly established baseline, the GEM Plan consists of a map and description of the final environmental challenges and the prescribed approach to their management. In addition, the GEM Plan includes a comprehensive list of future environmental management goals and objectives and a course-specific set of best practices.

The following environmental challenges were identified during the GEM process:

- Wetlands
- Invasive species
- Threatened or endangered species
- Water quality
- Historical/cultural
- Erosion
- Airfield safety criteria

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Golf Courses
Yokota AB, Japan

Every hole at the 18-hole Tama Hills Golf Course has two greens.

Assessing environmental challenges

The assessment of the environmental challenges is probably the most crucial as it provides a prioritized list of coordinated actions significant to the long-term success of the golf facility. The finalized GEM Plan will include the description, driver or requirement, management practice, objective, and target:

DESCRIPTION

Once the challenge has been identified, a short description and a few historical or statistical details assist greatly in understanding the key factors in devising management practices.

DRIVER/REQUIREMENT

Challenges are defined as “things that are bigger than the course”. Some of the reasons behind why a particular issue becomes a challenge are important to recognize and understand. A driver or requirement may be a local, regional, or national law, regulation, or initiative that creates the requirement to protect species, habitat, or preserve a resource such as open space or unique ecosystems.

OBJECTIVE

Objectives are the overall goals for environmental performance focusing specifically on management activities associated with each challenge and the potential for impacts. The objective should directly relate to the environmental policy.

MANAGEMENT APPROACH

A course’s approach to managing environmental challenges in accordance with the driver or requirement, environmental policy (see page 2), and established objectives and targets is the heart of the GEM Plan.

TARGET

The target is the time frame and/or quantifiable unit of measure to achieve the established objectives.

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Yokota AB, Japan

A delineated wetlands, an environmentally sensitive area, is just beyond the path.

WETLANDS

According to the Integrated Natural Resource Management Plan (INRMP), "The hydrology of Tama SA has been altered to some extent by the construction of the powder factory and its subsequent use. There are several small ponds and wetland areas located on the golf course and adjoining grounds. Some of the hills have natural seeps and springs that collect in low-lying basins between hills, coalesce into small streams, or enter drainage ditches. Small woodland wetlands have established themselves in the low areas without drainage. The small stream watershed has been significantly altered. Natural drainage patterns have been, at least in part, channelized over the years."

Driver/requirement

- Clean Water Act, Section 404
- National Pollutant Discharge Elimination System (NPDES)
- Executive Order 11990, Protection of Wetlands
- Japan Environmental Governing Standards (JEGS)

Objective

Ensure that all water bodies continue to be free of pollutants potentially attributable to a golf course management practice.

Management approach

- Establish, document and communicate fertilizer and pesticide application buffers to all appropriate employees or service providers
- Comply with all requirements included in the approved installation SWPPP
- Ensure all spill prevention procedures and spill kits are in place and all pertinent employees are adequately trained to correctly and promptly perform required actions in an emergency situation

- Compile a comprehensive Water Resource Management Plan for the entire golf course facility

Target
Eliminate the potential for degradation of the water resources at the golf course by establishing, documenting and communicating all pesticide and fertilizer application buffers to appropriate personnel prior to the end of the year.

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Golf Courses
Yokota AB, Japan

Quality signage can help customers and employees alike in accomplishing the goal of protecting wetlands and other environmentally-sensitive landscapes.

Yokota AB
Golf Courses
Yokota AB, Japan

Photo credit:
Al Bancroft

Wild boar damage recently incurred on the 12th fairway.

INVASIVE SPECIES

According to the Tama Hills superintendent, "Damage from rooting pigs began 3-4 years ago. Damage was limited to non-playable areas and considered a nuisance at worst. At the time, there were no efforts to control the wild boar population. Due to increased boar population and a harsh winter, rooting has begun in playable areas of the Tama Hills Golf Course. Seven separate areas of the course have been severely damaged leaving a roto-tilled appearance that is totally unplayable for Tama Hills' many customers. Repair to these areas is labor intensive and detract from general course maintenance activities.

Driver/requirement

- Federal Noxious Weed Act of 1974
- Executive Order 13112, Invasive Species
- National Invasive Species Act (1996)
- Plant Protection Act (2000)
- Federal Noxious Weed Act of 1976 (7 U.S.C. 2801)

Objective

Prevent introduction and establishment of invasive species to reduce their impact on the environment, economy and health of the United States and its leased properties overseas.

Increase player safety, golf course conditioning, and aesthetics through integrated pest management.

Management approach

- Drain recurring wild boar damage areas
- Aggressively trap and remove damaging animals
- Never knowingly install a listed or potentially invasive species
- Regularly inspect likely areas for invasives to establish themselves
- Work with installation environmental staff to contain or reduce invasives
- When possible, restore native species and habitat conditions
- Train all pertinent employees on the latest invasive species identification and control measures
- Restore disturbed areas dominated by invasive species to natural vegetation where practical and consistent with mission requirements
- Utilize native or indigenous plant materials whenever possible
- Repair perimeter fence to prohibit unwanted wildlife entry to Tama GC

Target

Conduct invasive species survey and complete an approved plan to contain or reduce undesirable varieties prior to the end of FY10.

Yokota AB
Golf Courses
Yokota AB, Japan

Japanese Wild Boar, Sus scrofa leucomystax, is a particularly damaging invasive species.

Yokota AB
Golf Courses
Yokota AB, Japan

Longstem adderstongue, or Ophioglossum petiolatum, is the primary protected species of concern for Tama Hills' golf managers.

THREATENED OR ENDANGERED SPECIES

According to the INRMP, "Endangered grass species were identified at Tama SA. The biodiversity survey of Tama SA (USACE, 2001) identified a species, *Ophioglossum petiolatum,* listed as endangered by the Tokyo Metropolitan Government (TMG), surrounding rough area of the green at the 15th hole at the Tama Hills golf course".

Driver/requirement

- Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543)
- USAFI 32-7064, Integrated Natural Resources Management, 1 Sep 04
- Japan Environmental Governing Standards (JEGS)

Objective
Never allow a management practice to negatively impact a known threatened or endangered species on or near the golf course.

Management approach
- Preserve and protect the existing *Ophioglossum petiolatum* specimens near or around the 15th green at Tama SA
- Ensure that the maintenance practices for all identified potential threatened or endangered species habitats are regularly coordinated with installation environmental staff

Target
Request a site assessment and review of current management practices at once.

Yokota AB
Golf Courses
Yokota AB, Japan

The 15th hole is a short par three and is nearly surrounded by natural or minimally-maintained areas containing identified endangered plants.

Yokota AB
Golf Courses
Yokota AB, Japan

This concrete drain is close to a closely-mown, highly-maintained area of the course.

WATER QUALITY

Drainage ways, both natural and manmade, are commonplace on most golf courses. Tama Hills is no exception. Several concrete structures have been constructed over the years to accommodate storm water and regular runoff. Some are very close to the golf course or maintenance complex operations that need to be closely managed to minimize or eliminate potential negative impacts.

Driver/requirement

- Clean Water Act, Section 401
- National Pollutant Discharge Elimination System
- Safe Drinking Water Act
- Federal Water Pollution Control Act of 1977 (Clean Water Act), as amended (33 U.S.C. 1251-1376)
- Japan Environmental Governing Standards (JEGS)

Objective

Ensure that water bodies are never subject to pollution from any golf course management practice.

Management approach

- Floor drains are directed to sanitary drains with oil water separator
- Operational protocol understood by employees
- Drums stored on pallets
- Spill response equipment
- Dumpsters covered
- All material and waste stored inside buildings or cabinets
- Covered wash rack with grass cuttings trap

- Tanks are double walled
- Repair activities are performed under a covered area
- Covered & bermed pesticide/herbicide storage and mixing area
- Flammables stored in secure cabinets
- Drip pans under dispensing units
- Site personnel perform visual inspections of the area
- Security fencing installed
- Operational protocol understood by employees
- Spill response equipment is available
- Inspections performed
- Activity performed inside facility
- Secondary containment for fuel storage tank
- Drip pans under dispensing units
- Consult with installation environmental staff to ensure that golf course maintenance practices are fully compliant with complex regulations
- Compile a comprehensive Water Resource Management Plan for the entire golf course facility

Target

Eliminate the potential for degradation of the water resources at the course by establishing, documenting and communicating all pesticide and fertilizer application buffers to appropriate personnel prior to the end of the year.

Maintain positive relationship with civil engineering and environmental staffers to attain and maintain compliance on all water-related regulations and requirements.

Pavement associated with the new oil/water separator project should improve water quality management around the Tama Hills maintenance complex.

Yokota AB
Golf Courses
Yokota AB, Japan

Yokota AB
Golf Courses
Yokota AB, Japan

The World War II era ammunitions assembly facility is an historical site.

HISTORICAL / CULTURAL

The Integrated Cultural Resources Management Plan states "Yokota AB and Tama Service Annex (SA) have their origins in World War II facilities constructed by the Japanese Army in 1938 and 1939. Yokota was an important facility for testing newly developed and captured aircraft, and for training aircraft maintenance crews. Tama SA was a Japanese Army arsenal, dug into the ravines of the Tama Hills and hidden by their forest canopy. While much of this facility was destroyed during the construction of the Tama Hills Golf Course, a significant portion remains intact. Inagi City officials consider the structures remaining from the arsenal a significant historical resource. Plans for the management of these structures should be developed in cooperation with Inagi City".

The ICRMP states, "The Services Division often finds itself occupying older structures, some of which have historic potential. 374/MSG SVS has responsibility for the Tama Service Annex (SA), as well as some structures at Yokota AB. Tama SA contains known archaeological sites and includes historically important structures and important natural resources. Proper maintenance of the cultural resources at Tama SA can enhance the recreational experience of the users of the facility. Services should participate in planning for the management of cultural resources at Tama SA. This plan should be developed in conjunction with the Inagi City Board of Education."

Driver/requirement

- Archaeological and Historical Preservation Act (16 U.S.C. 469)
- National Historic Preservation Act
- Status of Forces Agreement (SOFA) between the US and Japan
- Japan Environmental Governing Standards (JEGS)

Objective
Comply at all times with the prescribed practices identified in the Cultural Resources Management Plan (CRMP).

Management approach
- Regularly consult with installation cultural resource manager to ensure constant compliance with the Cultural Resources Management Plan (CRMP)
- Submit forms AF-103, *Work Clearance Request*, and AF-332, *Work Request,* DoD 1391, *Military Construction Project Data,* and USFJ form 22, *Host Nation Project Documentation,* to 374 CES for timely review and approval prior to commencing project work
- Protect any cultural resources encountered from damage or theft
- Report any cultural resources encountered in construction or maintenance work to the Cultural Resource Manager (CRM)

Target
Ensure that there are no negative impacts to cultural amenities that shall be attributed to the golf course staff or its management practices.

Yokota AB
Golf Courses
Yokota AB, Japan

Accurate interpretive information nicely displayed adds class to facility.

Yokota AB
Golf Courses
Yokota AB, Japan

Regularly raking leaves, steep slope, heavy rains and time add up to erosion of valuable topsoil and sedimentation of storm water runoff.

EROSION

"Inappropriate clearing of vegetation in out-of-bounds areas on the golf course at Tama (those areas under the control of 374 CES/CEOE)". "Sodding is a permanent erosion control practice that involves laying a continuous cover of grass sod on exposed soils. In addition to stabilizing soils, sodding can reduce the velocity of storm water runoff. Sodding can provide immediate vegetative cover for critical areas and stabilize areas that cannot be vegetated by seed. It can also stabilize channels or swales that convey concentrated flows and can reduce flow velocities. Sodding is appropriate for any graded or cleared area that might erode, requiring immediate vegetative cover. Locations particularly well suited to sod stabilization are residential or commercial lawns and golf courses where prompt use and aesthetics are important, steeply-sloped areas, waterways and channels carrying intermittent flow, and areas around drop inlets that require stabilization."

Driver/requirement

- Clean Water Act, Section 401
- Japan Environmental Governing Standards (JEGS)

Objective

Ensure areas subject to potential soil erosion are regularly monitored by quality assurance and environmental personnel and control measures are implemented promptly when necessary.

Management approach

- Regularly monitor areas subject to potential erosion
- Consult with appropriate environmental personnel
- Improve all identified erosive areas with sod or organic mulches

- Provide entire construction work for complete retaining wall or water flow rerouting

Target
Comply with all erosion control guidance, measures and best management practices at all times by requesting an annual course review by appropriate installation environmental personnel.

Yokota AB
Golf Courses
Yokota AB, Japan

Letting fallen leaves lie could be a best practice to prevent erosion on this hillside.

Yokota AB
Golf Courses
Yokota AB, Japan

Denuded soils can be protected with mulch or shade-loving plants.

Yokota AB
Golf Courses
Yokota AB, Japan

These trees are designated for removal due to airfield safety criteria enforcement.

AIRFIELD SAFETY CRITERIA

As stated in the General Plan, "Future development at Yokota AB must be compatible with airfield operations and other mission related activities. Factors influencing development decisions include airfield clear zones and other imaginary surfaces that require safeguarding against accidents, aircraft noise generation and explosive safety restrictions." In the case of the Par 3 course on Yokota's main base, there are several obstructions to trees and light poles that apparently are in violation ofcurrent airfield safety criteria. Several trees have been designated for removal. Lights used to enable nighttime play at the short, 811 yard course will remain.

Driver/requirement

- AFI 32-7063, Airfield Installation Compatible Use Zones, (AICUZ)
- UFC 3-260-1, Airfield & Heliport Planning & Design

Objective

Assist with the elimination of all airfield criteria waivers and continue coordination and communication with airfield managers.

Management approach

- Secure funding to relocate all portions of the golf facility requiring waivers
- Assist installation airfield managers in their quest to eliminate all waivers

Target

Eliminate all golf-related waivers by 2015.

Implementation

No plan is worth the time it took to compile it if it does not generate or include active implementation in the field. The golf course management staff should use the following goals and objectives as the roadmap for their future. The GEM Plan is an example of the quality a cooperative effort can produce. Let's get something done and better take care of the environment, our community and our customers.

GEM Plan goals & objectives

Goals are defined as actions or results that should be accomplished within the next year.

- Ensure that all employees received documented training that would increase their awareness of the GEM program environmental stewardship goals and objectives
- Regularly check the irrigation water quality to determine nutrient, salt or total suspended solid parameters
- Make certain that oil/water separators and/or golf course wash racks are operating properly and correctly maintained at all times
- Request and accomplish a comprehensive energy audit for the entire golf course facility

Objectives are defined as actions or results that are desired to be accomplished prior to the next INRMP update scheduled for 2015.

- Compile and utilize a Tree Management Plan complete with planting plan and maintenance schedule for the entire golf course facility
- Compile a written comprehensive Golf Course Water Resources Management Plan that delineates the care of each of the course's water features

GEM Plan best practices

Best practices are defined as any action, method, practice, or result that has proven its value and worth over time. The GEM program has been designed to create a body of scientific data to share with all U.S. Air Force installation golf and environmental staff members.

- Utilize a calendar-based cultural program that reflects past experiences and is updated annually

Yokota AB
Golf Courses
Yokota AB, Japan

The pond on the 16th hole is one of the few traditional water features on the course.

Conclusion

Blessed with fine terrain, a nice design, quality staff and supporting facilities coupled with the phenomenal Japanese cultural ethics, Tama Hills Golf Course has be ability to be the premier golf facility in the Department of Defense. Continued support of improvements by commanders and reinvestment of well-earned profits will stoke the Tama Hills creative fires resulting in top quality recreational opportunities at the important Yokota AB. No restrictions to realizing this potential was observed during the site visit. Let's hope that the effort continues.

The gallery

On the following pages are some of the more revealing photographs of challenges, maintenance practices, and other areas of the golf course facility.

Historical structures abound in the Tama SA

The Par 3 clubhouse is attractive and functional.

High maintenance for some Par 3 Course teeing areas.

Range at Par 3 is not making any money due to damage.

Tama Hills is one beautiful place!

Old bunker at the 18th dogleg has been slow to fill in.

Some of the cart paths are extremely steep.

Eliminate high maintenance and unattractive planters.

Safety messages must be intelligible to all.

Oil/water separator project will improve stewardship.

Maintenance activities in close proximity to stream.

Maintenance facility is a multi-functional space.

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