



***Gateway Hills Golf Course  
Environmental Management (GEM) Plan  
Lackland AFB, TX***



**March 2008**



**San Antonio, Texas**



## ***Gateway Hills Golf Course Environmental Management Policy***

**In concert with the  
Lackland AFB 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 March 2008:

- **Actual ECQ = 59, Just started (Red)**
- **Potential ECQ = 82, Showing progress (Yellow)**

### Potential or Final environmental challenges

The following potential environmental challenges were identified in compiling this **Draft** GEM Plan:

- Water quality, floodplains & storm water management
- Erosion control
- Invasive species
- Water conservation
- Bird/wildlife Aircraft Strike Hazard (BASH)
- Wetlands

## **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/>).



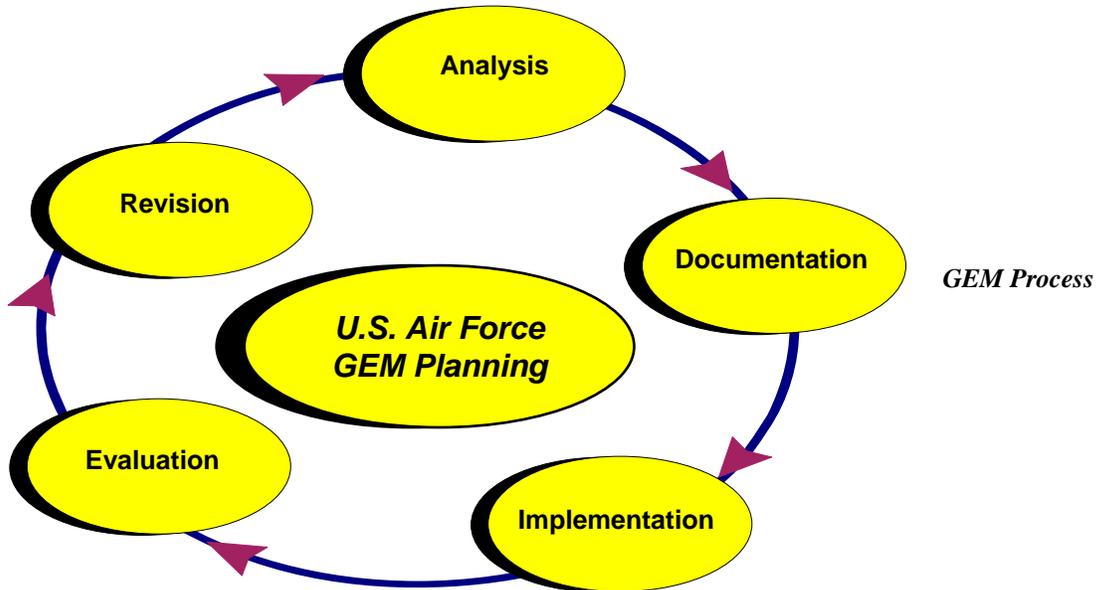
*Gateway Hills GC  
Lackland AFB, TX*

*The course's new bridges should be the U.S. Air Force standard.*

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

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 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.



*Gateway Hills GC  
Lackland AFB, TX*

*Another fine day in San Antonio begins as the sun peers over the horizon at the 1<sup>st</sup>.*

## **GEM PLAN COMPONENTS**

The GEM Plan will be comprised of the following components:

- GCEBA report or the Draft GEM Plan for AFCEE review
- Map of the entire golf course facility grounds depicting locations of the significant environmental management challenges and the golf course facilities
- Specific installation environmental staff-approved management approach to be employed by the golf course staff to deal with each environmental challenge
- Compilation of best practices employed at the golf course in their implementation of the GEM program recommendations
- Final GEM Plan report in MS Word and Adobe PDF formats

## **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 planning process.

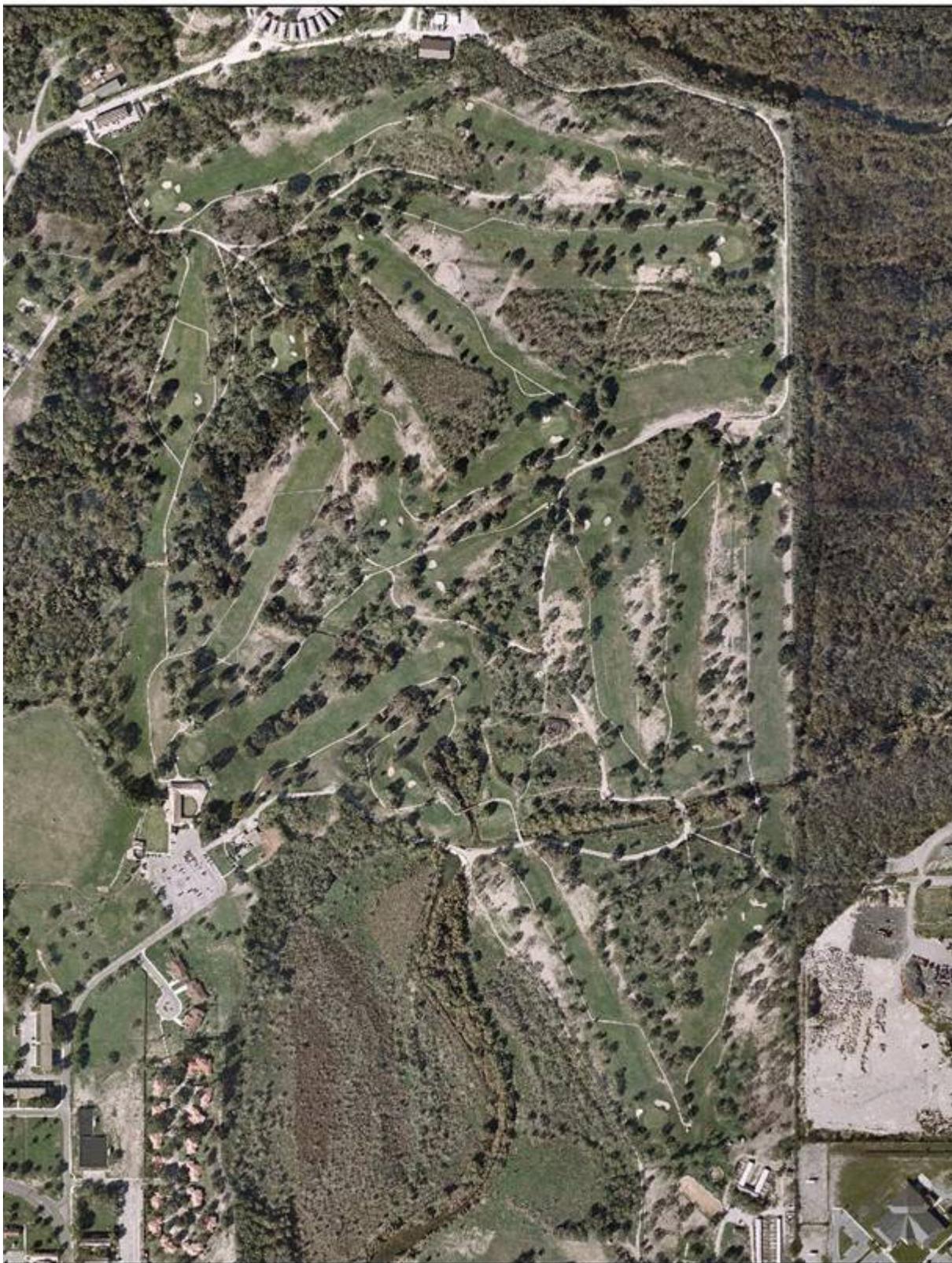
### Course Details

Architect	COE, Joe Finger
Year constructed	1940, 1949-50
Climate	Texas flood/drought
Average annual precipitation	33 inches
Average growing season	275 days
Elevation	~650 feet ASL
Prevailing wind direction	NE & SW
Total facility acreage	240 acres
Total actively maintained acreage	120 acres
Par	36-36-72
Yardage/Rating/Slope	Blue- 6917/73.1/125 White- 6544/71.2/113 Gold- 5818/67.7/113 Red- 5437/71.5/116
Turfgrass	419 Hybrid Bermudagrass
Tees-	Common Bermudagrass
Fairways-	328 Hybrid Bermudagrass
Greens	Bermudagrass/Mixed
Roughs-	
Irrigation source	Treated effluent (Recycled)

### Course Description

Gateway Hills Golf Course enjoys the well-deserved reputation as providing the best golf experience for the money in south central Texas. The course features diverse, beautifully sculpted holes expertly draped over the natural, rolling terrain. The meandering Leon Creek must be crossed several times during a round. Course management and their friendly, able staff maintain the links to the highest possible standards while complying with water supply restrictions and the vast and sometimes dizzying array of environmental requirements. The superintendent is one of the most experienced in the USAF and is dedicated to providing the best turfgrass and playing conditions possible. A new irrigation system has recently been installed and the course is now reutilizing wastewater from the city of San Antonio water provider.

Leon Creek, which bisects and drains the course property, increases Gateway Hills' challenge for its customers and its managers while greatly enhancing the aesthetic and natural qualities of the course.



**Gateway Hills Golf Course Aerial Photo**



*Gateway Hills GC  
Lackland AFB, TX*

*The Gateway Hills pro shop provides all necessary amenities for its customers.*

## **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



*Gateway Hills GC  
Lackland AFB, TX*

*The greens design is still one of the highlights of the Gateway Hills Golf Course.  
Unfortunately, they are well past their expected life and need updating.*

## **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 finalizing or fully implementing a particular practice or procedure.

## **ECQ Scoring Scale**

Percent Responses Yes  
or Partial per Category Level

90-100%	Advanced (Green)
70-89%	Showing progress (Yellow)
69% or less	Getting started (Red)

The following ECQ checklists are a record of the interview conducted with the course assistant manager, superintendent, and environmental staffer during the March 2008 visit to Lackland AFB.

<b>Planning &amp; Compliance</b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
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	Are environmental challenges and their approved and implemented management practices, objectives, and targets evaluated at least annually, and are they regularly communicated to employees, customers, management, and the local community?		✓	
6	Are there signs appropriately located to warn golfers of hazards of drinking reclaimed or otherwise non-potable water?	✓		
7	Are there signs posted that highlight key habitats or have appropriate areas been designated "Environmentally Sensitive Zones" per The Rules of Golf?			✓
8	Is there a general understanding by the entire course management staff of how their practices may potentially adversely impact the environment?	✓		
9	Are the environmental impacts of pest control measures considered as part of the comprehensive GEM planning process?	✓		
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	Does the superintendent document the actual amount of each pesticide or fertilizer annually used on each major golf course feature (greens, tees, fairways, roughs, water features, and natural areas)?	✓		
14	Has the course attained full certification in the Audubon Cooperative Sanctuary Program or similarly recognized environmental management program?			✓
15	Are all employees trained in their native language on the benefits of minimizing potential negative impacts?			✓
16	Are comprehensive written records maintained to measure and document the environmental compatibility of the entire facility's management practices?	✓		
17	Are there documented aesthetic or functional thresholds integrated into the pest control decisions?	✓		
18	Is there a written and regularly updated Integrated Pest Management Plan for the entire golf course property?		✓	
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	Has course management comprehensively examined the course to determine the activities that have a potential to negatively impact an identified environmental challenge?		✓	
<b>Totals</b>		<b>9</b>	<b>7</b>	<b>4</b>

<b><u>Operations &amp; Maintenance</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Is contour mowing used to conserve fuel and/or to increase playability and aesthetics?	✓		
2	Are there designated non-maintained or minimally maintained buffers around 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 drainage improvements regularly implemented to improve soil health and minimize or eliminate use of pesticides or fertilizers?	✓		
5	Have all playing surfaces been inventoried and mapped for soil types including soil structure, nutrient levels, organic content, compaction, and water infiltration?		✓	
6	Are soil tests or plant tissue analysis used to determine turfgrass nutritional requirements?	✓		
7	Are there projects planned and funded for the next year that would increase the compatibility of the course's management methods with protection of the environment?		✓	
8	Are all appropriate employees trained to be familiar with (national, federal, state, and OSHA) regulations that apply to storage and handling of potentially hazardous materials used on the property?	✓		
9	Has there been a complete examination of all aspects of the operation other than the golf course (snack bar/restaurant, clubhouse, pro shop, pesticide mixing and storage facilities, fuel storage and delivery areas, and maintenance complex) for potential negative environmental impacts?	✓		
10	Are all employees encouraged to apply for education and training opportunities that may increase their awareness of the GEM Plan goals?			✓

**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 eliminates the potential for spreading of contamination?	✓		
14	Are recycling containers located throughout the facility for use by customers and employees?		✓	
15	Are grass clippings left in place (other than greens) collected, composted, and/or recycled?	✓		
16	Are products that minimize unnecessary packaging considered prior to purchasing for use throughout the facility?		✓	
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 and have steps been taken to reduce these quantities?			✓
19	Does the restaurant/snack bar facility utilize at least 90% plates, cups, and utensils that are reusable rather than disposable?	✓		
20	Is the food storage and prep area regularly cleaned to reduce the likelihood of pest infestations and required pesticide applications?	✓		
	<b>Totals</b>	<b>12</b>	<b>6</b>	<b>2</b>

<b><u>Water Resource Management</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are written records of water quality monitoring activities, results, and pollution control measures readily available?	✓		
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	Is the irrigation system utilized solely based on the specifically calculated local daily evapotranspiration rate?		✓	
4	Are outdoor irrigation of non-golf course areas and indoor plumbing regularly monitored and maintained for leaks?		✓	
5	Have low-flow water saving devices been installed wherever possible?	✓		
6	Are recycled or other non-potable water supplies being used to irrigate at least 65% of the golf course property?	✓		
7	Are there projects planned that should eliminate or minimize a potential water quality or erosion problem?			✓
8	Are water features regularly monitored for algae, erosion, excessive aquatic plant growth, eutrophication, and sedimentation?	✓		
9	Is runoff from parking lots cleansed by control measures such as vegetative or drainage filters prior to leaving the golf course property?			✓
10	Are there procedures for reporting water quality problems to supervisors (as required) for appropriate action?	✓		

**Water Resource Management Checklist (continued).**

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Is the irrigation pumping station and associated equipment regularly checked for proper operation and leaks?	✓		
12	Has the irrigation system or its components recently been upgraded to reduce inefficiency, malfunction, and overall water use and are flow meters used to monitor water use and detect potential waste?	✓		
13	Is there a map of the watershed in which the golf course property resides and location(s) of floodplains and stormwater drainage exist on the property?		✓	
14	Is the quality of the water entering and leaving the property tested regularly for contaminants, pH, dissolved oxygen, and nutrients?	✓		
15	Is water quality data collected to establish baseline conditions for all water features on the property?	✓		
16	Are settling ponds and/or detention ponds used to effectively remove sediments and pollutants from water features?			✓
17	Are biological processes such as the addition of grass carp or white amur used to control unwanted aquatic vegetation in water features?	✓		
18	Is there a written Water Resource Management Plan that delineates the care of the course's water features to include creeks, streams, ponds, irrigation system components, conservation efforts and water supply concerns?			✓
19	Has the property been examined for potentially significant wetlands or associated sensitive water-based habitats?	✓		
20	Has the property's water features been studied to determine the aquatic and amphibious species population?	✓		
<b>Totals</b>		<b>13</b>	<b>3</b>	<b>4</b>

<b><u>Conservation</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Is all motorized golf course equipment checked regularly for excessive air polluting emissions?	✓		
2	Has the entire golf course property been examined for critical habitats, state species of concern, and threatened or endangered species?	✓		
3	Have all potentially significant wildlife habitats and their maintenance practices been coordinated with local natural resource manager, the Fish & Wildlife Service, or other appropriate local or regional regulatory agency?		✓	
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 connect natural areas to facilitate wildlife movement through the course property?			✓
6	If applicable, have all necessary permits been 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 or exotic species on or near the course?			✓
9	Is there a readily available Drought Management Plan for the entire golf course facility?			✓
10	Is there at least one project planned and funded that is expected to minimize or eliminate the course's potentially existing negative environmental impacts?	✓		

**Conservation Checklist (continued).**

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Is storm water collected for supplementing irrigation water supplies for use anywhere on the golf course facility grounds?			✓
12	Are a majority of plants used in landscaped areas drought-tolerant native trees, shrubs, groundcovers, or their cultivars?	✓		
13	Have local wildlife species and their habitats been documented and mapped?			✓
14	Does the course have a Tree Management Plan complete with planting plan and maintenance schedule?		✓	
15	Are all employees trained to understand that poor management practices may adversely impact worker and environmental health and welfare?		✓	
16	Is there an inventory of bird and mammal species documented, maintained, and readily available?		✓	
17	Are food, shelter, and nesting attributes of plant species for landscape development considered during the design/selection process?	✓		
18	Have all 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	Are customers and employees regularly informed/trained on the golf course's conservation practices?			✓
<b>Totals</b>		<b>8</b>	<b>5</b>	<b>7</b>

<b><u>Pesticides &amp; Pollution Prevention</u></b>				
<b>#</b>	<b>Environmental Compatibility Indicator</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
1	Are there minimally maintained, natural areas, no spray zones, and buffer areas around water features or sensitive landscapes and have they been communicated to equipment operators and pesticide applicators?	✓		
2	A spill containment kit is readily available and spill containment procedures are in place?	✓		
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 to contain spills?	✓		
5	Are liquid products stored below dry products and are dry materials stored on pallets or shelves to keep them off the floor?	✓		
6	Are equipment or vehicle wash and wastewater kept from making direct contact with surface water?	✓		
7	Is equipment cleaned with compressed air or with blowers on part of the course instead of or prior to washing at a designated wash rack where pollution prevention measures are employed?	✓		
8	Are gasoline, motor oil, brake and transmission fluid, solvents, and other chemicals used to operate or maintain equipment and vehicles prevented from directly or indirectly entering water bodies?	✓		
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 playing area) of each pesticide used; - the area (SF/SM) and quantity of each pesticide used; - the chemical or common name of the active ingredient(s); - the date, location, or purpose?	✓		

**Pesticides & Pollution Prevention Checklist (continued).**

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Is there a map of the course's "hot spots" that may require special care or attention?		✓	
12	Are there trained scouts on staff other than the superintendent 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 insects, fungal diseases, and weeds for all managed areas that may possibly 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 chemical applicator(s) encouraged to apply for regular training to maintain currency?	✓		
17	Is the chemical storage structure/area locked, well-ventilated, fire resistant and is access limited to appropriate personnel?	✓		
18	Are records of pest treatments and their effectiveness maintained and used to guide future pest control decisions?	✓		
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?			✓
<b>Totals</b>		<b>17</b>	<b>2</b>	<b>1</b>



*Gateway Hills GC  
Lackland AFB, TX*

*Improvement to the clubhouse and practice facilities has long been a priority of course management.*

<b>Environmental Compatibility Quotient Summary</b>			
<b>Environmental Compatibility Category</b>	<b>Yes</b>	<b>Partial</b>	<b>No</b>
<b>Planning &amp; Compliance</b>	<b>9</b>	<b>7</b>	<b>4</b>
<b>Operations &amp; Maintenance</b>	<b>12</b>	<b>6</b>	<b>2</b>
<b>Water Resource Management</b>	<b>13</b>	<b>3</b>	<b>4</b>
<b>Conservation</b>	<b>8</b>	<b>5</b>	<b>7</b>
<b>Pesticides &amp; Pollution Prevention</b>	<b>17</b>	<b>2</b>	<b>1</b>
<b>Totals</b>	<b>59</b>	<b>23</b>	<b>18</b>

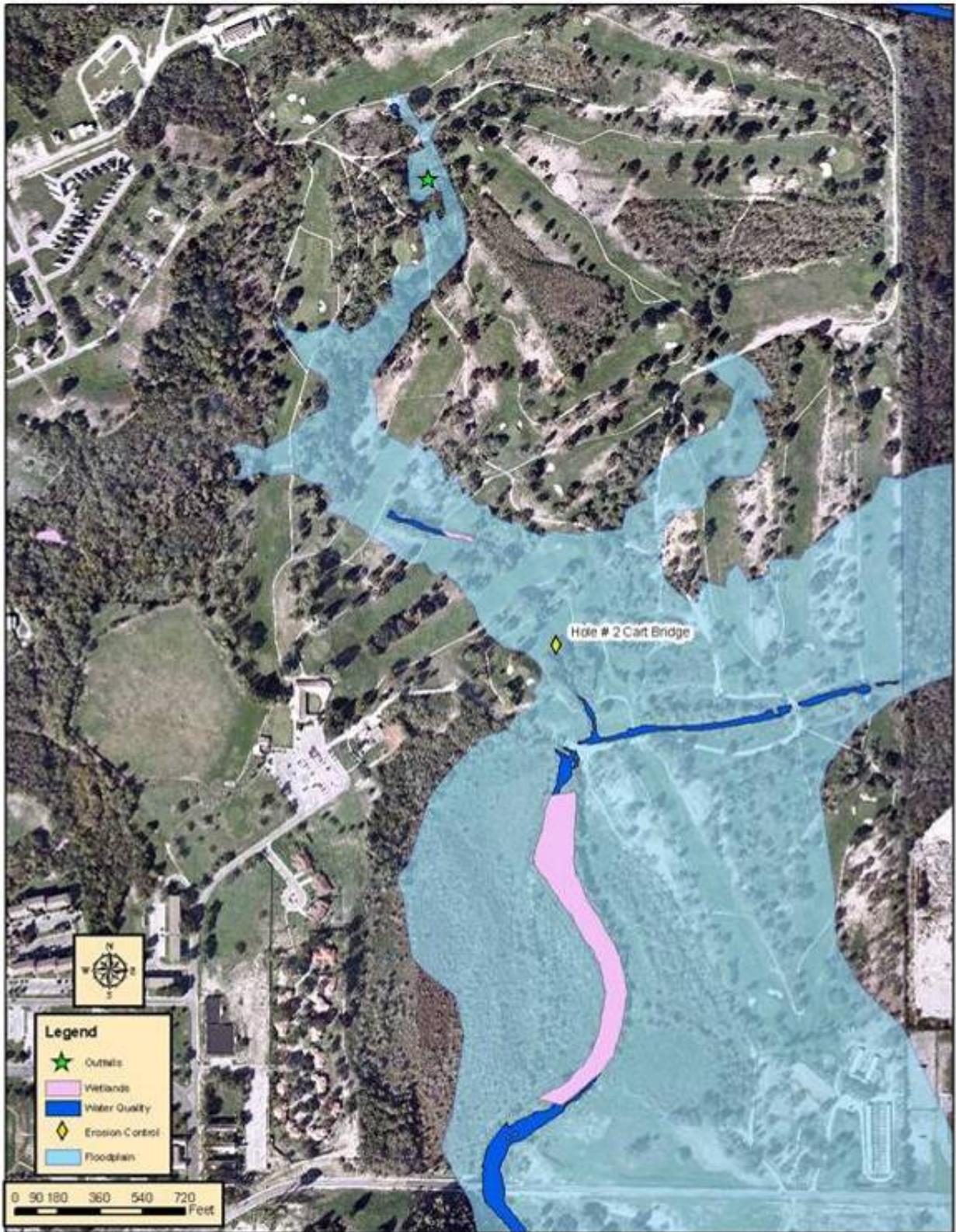
*Key to checklist responses*

- **Yes** = Practice is complete or ongoing and can be verified
- **Partial** = Practice has been started but not entirely completed
- **No** = Practice is not in place

**March 2008 – Gateway Hills Golf Course ECQ:**

- Actual ECQ = 59, Just started (**Red**)
- Potential ECQ = 82, Showing progress (**Yellow**)

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



## Gateway Hills Golf Course Environmental Challenges Map



*Gateway Hills GC  
Lackland AFB, TX*

*Maintaining compliance is a daily accomplishment by the Gateway Hills Superintendent and his staff.*

## Environmental Challenges

One of the important results of the GCEBA process is the identification of significant environmental challenges to be addressed in the GEM Plan. Ideally, the golf staff will address their management approach to each challenge to accomplish course and local community environmental management objectives while still attaining acceptable levels of course playability and customer satisfaction. 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:

- Water quality, floodplains & storm water management
- Erosion control
- Invasive species
- Water conservation
- Bird/wildlife Aircraft Strike Hazard (BASH)
- Wetlands



## **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.



*Leon Creek can create havoc during a large rain event.*

*Gateway Hills GC  
Lackland AFB, TX*



*Gateway Hills GC  
Lackland AFB, TX*

*Leon Creek can be a slow moving linear pond or a raging torrent.*

### **Water quality, floodplains & storm water management**

Leon Creek is a thirty-six mile long intermittent stream that rises in northwestern Bexar County that eventually flows southeast through Lackland and its golf course. Unfortunately, with the continued rapid development upstream in metropolitan San Antonio, runoff velocity and quantity continue to increase. Accordingly, the course is subject to significant damage during and after any major precipitation event. During just the last decade, the area has experienced at least two 100-year floods along with several other damaging storms. Due to environmental concerns, extreme care must be exercised prior to significant changes to any of the regular maintenance performed along these water features.

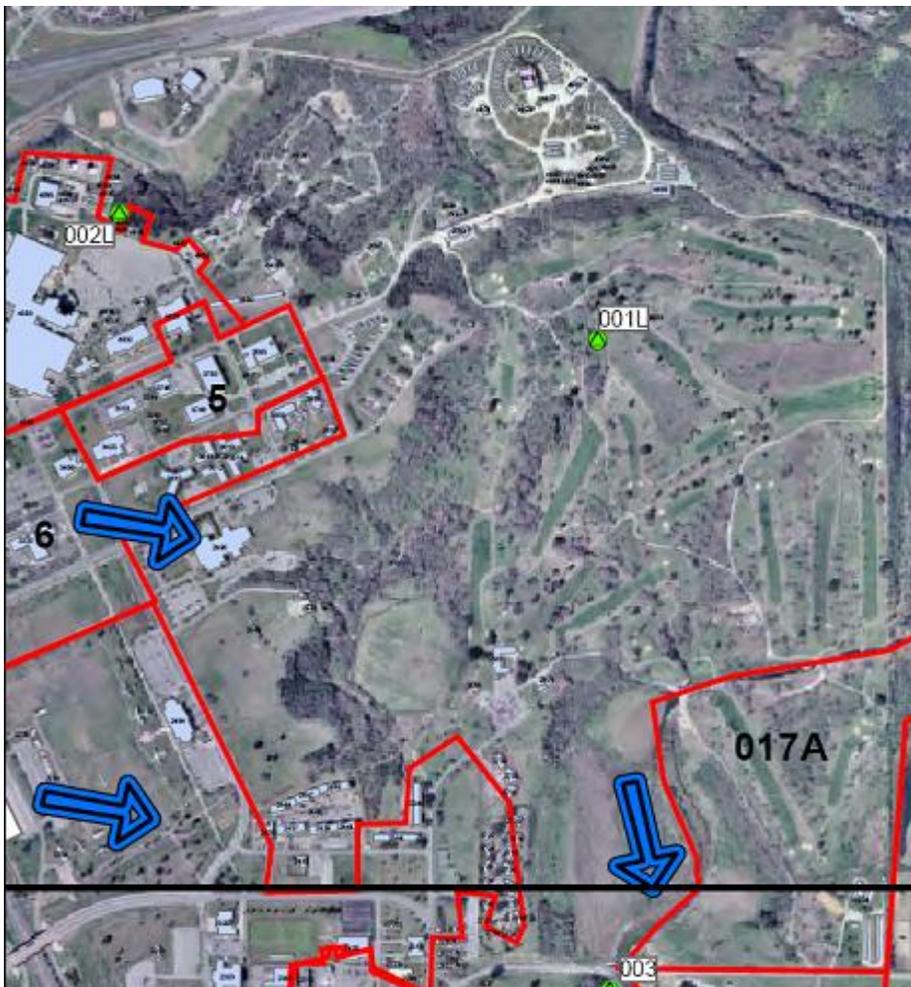
Although the INRMP states that “mission impacts to the water quality of Leon Creek occur primarily from stormwater runoff from Lackland Main Base and Kelly Field Annex and non-point pollution from golf course maintenance”, this is only part of the story. It has long been known that people use chemicals and fertilizers much more readily and indiscriminately around their homes. U.S. Air Force golf course managers are subject to nearly every known law and regulation. In addition, chemical or fertilizer applications are expensive and over a large area. All superintendents monitor weather forecasts and plan significant treatments accordingly. Management practices will continually focus on this issue in accordance with the established environmental policy included earlier in this GEM Plan.

Additionally, the INRMP names the golf course as one of the “sources of pollution at Lackland AFB that have the greatest potential to impact water quality” although it also states that “the potential for pollution of the underlying Edwards Aquifer beneath the base from surface sources is low due to the confined nature of the aquifer and isolation from point sources at the surface by approximately 1,000 feet of overlying

rock and clay. There is the potential for the aquifer to become contaminated through the introduction of contaminants into water wells at the base through corroded casings or at the wellheads. Routine sampling of groundwater from the Lackland AFB water wells has not detected the presence of man-made contamination". It is suspected that the golf course is at least partially responsible for this clean bill of health.

The Gateway Hills Golf Course has also been identified by the INRMP as a potential non-point pollution source which defines this as "a general term for pollution that is not collected in and discharged through pipes or other defined points such as a sewage treatment plant". Non-point source pollution is a general term for pollution that is not collected in and discharged through pipes or other defined points such as a sewage treatment plant. The INRMP states "Potential non-point source pollution sources at Lackland AFB include:

- General storm water runoff
- Fertilizer and lawn maintenance chemical runoff from the golf course, residential areas, and other landscaped areas
- Sediment runoff and airborne dust from construction sites and training areas
- Sediment and debris runoff from prescribed burns



*Gateway Hills GC  
Lackland AFB, TX*

*Stormwater runoff flows from off-base through Leon Creek as well as from on base.*

According to the SWPPP, there is a potential for pollution from golf course industrial-type facilities. Accordingly, the Gateway Hills staff is using the latest best practices such as these at the maintenance complex:

- 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

The golf cart storage building staff is using the following best practices:

- Security fencing
- 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



*Gateway Hills GC  
Lackland AFB, TX*

*One of the new bridges stands ready for the next storm's onslaught.*

**DRIVER/REQUIREMENT**

- Clean Water Act, Section 401
- Texas Pollutant Discharge Elimination System (TPDES)

**OBJECTIVE**

Maintain compliance with all water quality-related requirements.

**MANAGEMENT APPROACH**

- Establish, document and communicate fertilizer and pesticide application buffers to all appropriate employees or service providers
- Consult with environmental staff prior to any planned maintenance
- 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
- Identify all potential impacts to water quality in the Gateway Hills Water Resource Management (WRM) Plan

**TARGET**

Initiate any and all requirements immediately. Complete the WRM prior to the end of CY09.



*Gateway Hills GC  
Lackland AFB, TX*

*Even a relatively stout concrete cart path is no match for some of Texas' larger downpours. In addition to the damage to a capital investment, the area is now more easily eroded. Safety is also a major reason for rapid repairs.*



*Gateway Hills GC  
Lackland AFB, TX*

*Part of the bank near the driving range is failing causing both a short term safety and a long term erosion concern for the Gateway Hills staff.*

## **Erosion control**

Unfortunately, the same reason that the Gateway Hills Golf Course is such an interesting and fun course to play is why the layout is subject to constant threat of erosion. Leon Creek has turned into a torrent several times over the last decade due to high precipitation events that usually coincide with major erosion. Bridges, fences and recently excavated stream debris have all suffered as a result. One area of extreme concern is really not related to the course yet occurs close by. A creek bank, more like a cliff face, really, has started to

### **DRIVER/REQUIREMENT**

- Clean Water Act, Section 404
- Clean Water Act, Section 401
- Texas Pollutant Discharge Elimination System (TPDES)

### **OBJECTIVE**

Minimize or eliminate all erosion on the golf course property.

### **MANAGEMENT APPROACH**

- Work closely with environmental and civil engineering staffs to ensure all golf course maintenance procedures are appropriate to minimizing or eliminating the potential for erosion on the facility grounds
- Incorporate any and all erosion control best management practices into daily maintenance processes as specified in the Gateway Hills Water Resource Management (WRM) Plan

**TARGET**

Initiate measures to stem erosion where possible. Complete WRM Plan no later than end of CY09.



*Gateway Hills GC  
Lackland AFB, TX*

*Many of the creek beds at Gateway Hills require attention.*



*Gateway Hills GC  
Lackland AFB,  
TX*

*The Gateway Valley course has closed since the last study.*



*Gateway Hills  
GC  
Lackland AFB,  
TX*

*Many of Gateway Hills' creek beds are havens for invasive species establishment.*

## **Invasive species**

According to the INRMP, "The land area on the Kelly Field Annex has predominantly been developed in support of Air Force mission. Approximately 25 acres within the golf course associated with a Navarro Clay Escarpment contains habitat that resembles shrub and woodland habitat, although its proximity to developed land and a maintained golf course has affected the natural vegetative make-up, and invasive species such as chinaberry and ragweed are more common." The golf course has many areas that are conducive to the establishment of invasive species stands.

Other species such as fire ants, Chinese tallow and giant reed (*Arundo donax*) should be dealt with immediately due to their ability to rapidly spread.

### **DRIVER/REQUIREMENT**

- Plant Protection Act (2000)
- Executive Order 13112, Invasive Species
- National Invasive Species Act (1996)

### **OBJECTIVE**

Regularly monitor the facility grounds for known invasive species and eliminate them in accordance with approved methods.

### **MANAGEMENT APPROACH**

- Conduct monthly inspections in areas known for their affinity for invasives
- Regularly consult with installation environmental staffers on management approaches as species are identified

### **TARGET**

Eliminate known pockets of invasive species within the next three years.



*Gateway Hills GC  
Lackland AFB, TX*

*Gateway Hills has been using recycled water for irrigation since 2004.*

### **Water conservation**

Golf industry water use is the number one issue affecting its future. At Lackland AFB, water conservation is a primary consideration as evidenced by their compliance with voluntary, year-round water use restrictions. Gateway Hills Golf Course recently installed irrigation system that began using San Antonio Water System (SAWS) recycled water in 2004. In addition, judicious use of this vital natural resource by course management has further alleviated the U. S. Air Force's dependency on groundwater in the San Antonio area. Although the Gateway Hills Golf Course is not subject to the region's water restrictions due to its changeover to recycled supplies for irrigation, its management and staff are committed to conserving on their water use throughout the facility.

The INRMP includes a "Water Conservation Policy" (WCP) for the installation that delineates Lackland AFB's commitment to "helping preserve our primary source of water, the Edwards Aquifer".

More significantly, as a result of a formal consultation with the U.S. Fish & Wildlife Service in compiling with Section 107 of the Endangered Species Act, a special group called the San Antonio Department of Defense signed a Biological Opinion (BO). The BO commits all parties to "rigorous water conservation efforts". To complicate matters, trigger values and stage numbers do not correspond with local efforts.

Lackland AFB established its first Water Conservation Plan in 1987. The plan was last updated in February 2004 and sets forth water conservation requirements that are consistent with the phased critical management period stages. This management plan is made available by the 37 CES to all base personnel through the base intranet. The web site also provides information/data on water stage restrictions, base maximum allowable water usage, golf course watering schedules

during drought conditions and water conservation schedules for base facilities and military base housing, including information on water conservation practices during normal (non-drought) conditions.

### **DRIVER/REQUIREMENT**

- Endangered Species Act
- Edwards Aquifer Authority implemented Critical Period Management Rules
- U.S. Fish & Wildlife Service Biological Opinion
- Lackland AFB Water Conservation Policy

### **OBJECTIVE**

Maintain compliance with installation Water Conservation Plan at all times.

### **MANAGEMENT APPROACH**

- Compile and implement a golf course-specific Drought Management Plan within the Gateway Hills Water Resource Management (WRM) Plan that fully complies with the installation Water Conservation Plan
- Maximize water conservation practices throughout the facility
- Utilize native, drought-resistant plant materials whenever possible during landscape development or other projects

### **TARGET**

Complete the Gateway Hills WRM Plan prior to the end of CY09.



*Gateway Hills GC  
Lackland AFB, TX*

*Newly installed comfort stations use little to no water resources.*



*Gateway Hills GC  
Lackland AFB, TX*

*Although BASH is not a major environmental challenge for the Gateway Hills staff, the installation does have an active flying operation and eliminating potential hazards should continue to be a daily management priority.*

### **Bird/wildlife Aircraft Strike Hazard (BASH)**

According to the BASH Plan, “Bird activity associated with the course has not been an issue except on rare occasions where birds such as cormorants, tree ducks, etc. move into the areas for short periods of time during migration.”

The INRMP lists 31 bird species and 1 bat species as having a potential to be involved with an aircraft collision. Other than transitory flocking birds, the INRMP identifies three potential bird threats to include roosting grackles in housing areas, doves and meadowlarks near the airfield, and nighthawks feeding near the airfield. There is no explanation as to why the actual enclosed BASH Plan highlights the golf courses as a potential threat and the INRMP does not.

#### **DRIVER/REQUIREMENT**

- Bird/Wildlife Aircraft Strike Hazard (BASH) Plan, 91-212
- FAA Advisory Circular 150/5200-33A, *Hazardous Wildlife Attractants On Or Near Airports*

#### **OBJECTIVE**

In direct support of the installation’s mission, the golf staff shall continue to cooperate and assist the environmental management staff with BASH reduction efforts.

#### **MANAGEMENT APPROACH**

- Coordinate all water feature maintenance procedures with installation environmental management staff
- Consider securing membership on BASH Working Group and attend meetings

#### **TARGET**

Complete coordination with environmental staff prior to the end of CY08.



*Gateway Hills GC  
Lackland AFB, TX*

*Water, and its management, is an important aspect of Lackland AFB's golf course.*

## **Wetlands**

According to the INRMP, "wetlands are typically defined as areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are considered Waters of the United States and as defined by Section 404 of the Clean Water Act can be under the jurisdiction of the U.S. Army Corps of Engineers". The INRMP further states "The largest single parcel of wetlands delineated on the Main Base was approximately two acres of shrub-scrub area on Leon Creek in the center of the southeast boundary of the Lackland Main Base. Three parcels of forested wetland were delineated, two along the unnamed tributary to Leon Creek in the northeastern-most portion, and another small parcel along the unnamed tributary to the immediate southwest of the golf course driving range. Herbaceous wetlands were identified in ditches, swales and ponds."

Of the 16.11 acres of delineated wetlands on Lackland AFB, only one is on or near the Gateway Hills Golf Course, the INRMP identifies it as a "small parcel along the unnamed tributary to the immediate southwest of the golf course driving range".

### **DRIVER/REQUIREMENT**

- Clean Water Act, Section 404
- Texas Pollutant Discharge Elimination System (TPDES)

### **OBJECTIVE**

Maintain compliance with pertinent regulations at all times.

**MANAGEMENT APPROACH**

- Establish, document and communicate fertilizer and pesticide application buffers to all appropriate employees or service providers
- Consult with environmental staff prior to any planned
- 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

**TARGET**

Initiate any and all requirements immediately.



*Gateway Hills GC  
Lackland AFB, TX*

*Although not technically considered a wetland, this small stream bed near the 11<sup>th</sup> teeing area is a great example of potentially sensitive landscapes on the Gateway Hills Golf Course.*

## 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 their roadmap for the future. Let's get something done.

### **GEM Plan goals & objectives**

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

- Complete and implement a facility-wide Tree Management Plan
- Complete and implement a facility-specific Integrated Pest Management Plan
- Create and maintain an Environmental Highlights customer information board in a highly visible location in the clubhouse
- Request and complete GEM-focused training to include installation-approved water quality reporting procedures and conservation practices for all employees

**Objectives** are defined as actions or results that are desired to be accomplished prior to the next INRMP update currently scheduled for 2012.

- Complete and implement a facility-wide Water Resource Management Plan
- Complete and implement a Golf Course Development Plan
- Implement and maintain a facility-wide customer/employee recycling program

### **GEM Plan best practices**

Best practices are defined as any action, method, practice, or result that has proven its value and worth over time.

- Removed over 40 acres from regular mowing saving countless labor hours, wear and tear on equipment and many gallons of fuel

## Conclusion

"The combination of challenging golf, tradition and history, and the important local environment is perhaps what makes it just so special".

### **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.



*The 1<sup>st</sup> hole approach shot is not tough – from the fairway!*



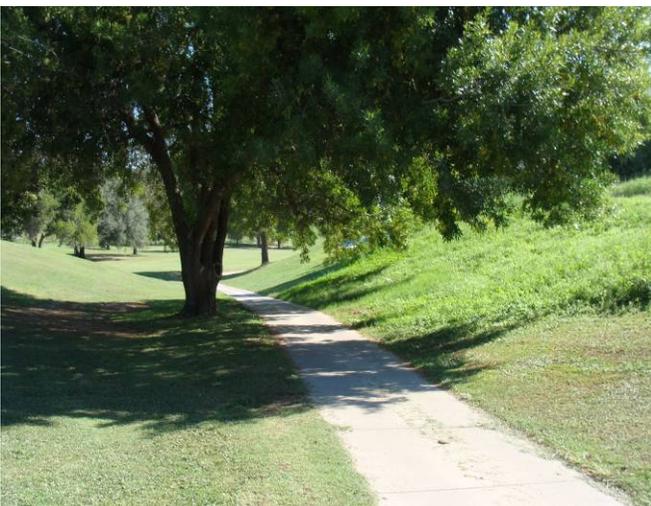
*Safety is a primary concern for the golf staff.*



*Issues abound when caring for a golf course.*



*Debris left over from the latest storm causes headaches.*



*Many areas of the course have reduced care practices.*



*Many critters thrive in the golf course's water features.*



*Gateway's snack bar does business the old fashioned way.*



*New cart paths improve the overall golfing experience.*



*Despite modern facilities, cart complex does it right.*



*This stream bed needs immediate attention.*



*The Director's office is as Spartan as it is undersized.*



*Tree care is a full time job at Gateway Hills.*



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Please visit our Golf Course Environmental Management Program website:  
**<http://www.afcee.brooks.af.mil/ec/golf/>**